All tutorial files can also be downloaded from: **www.3dartistonline.com/files**

www.3DArtistonline.com

3DArtist

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Practical inspiration for the 3D community

DESIGN AND CREATE CONCEPT VEHICLES

- Pro tips from Daniel Simon
- Expert design theory
- Master your renders

Digital sculpting tips and tricks

Develop your anatomy skills in ZBrush

BEHIND THE SCENES WETA DIGITAL

How the world's best visual effects are brought to life

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Become a Blender pro

15 basic steps to transform your work

RealFlow simulations

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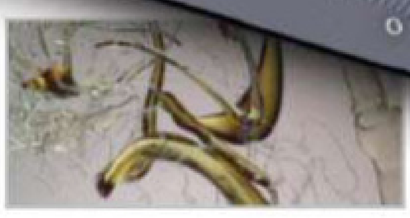

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Daniel Simon

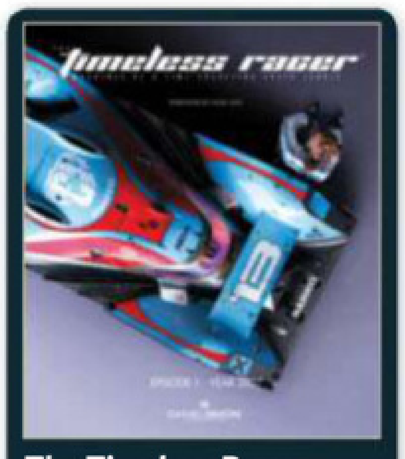
Personal portfolio site
www.danielsimon.com

Country US

Software Autodesk Alias, Bunkspeed Zoom, Photoshop

Hardware Boxx computer, NVIDIA GPUs

This issue we meet up with vehicle design genius Daniel Simon, who talks us through the processes and techniques he uses when creating unique cars. We also meet with the brains behind the next generation of VR technology, and Weta Digital reveals its work on Dawn Of The Planet Of The Apes.

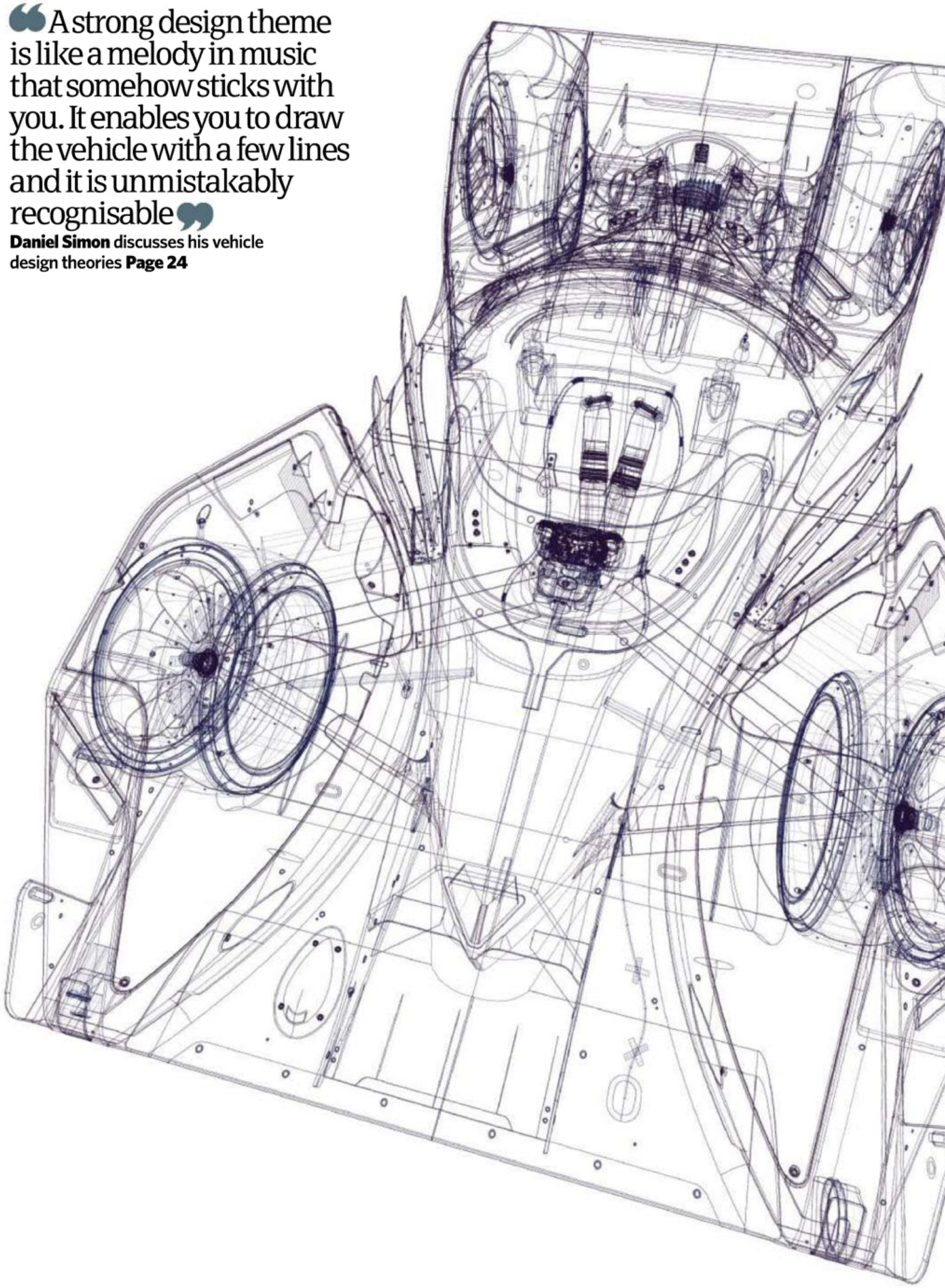


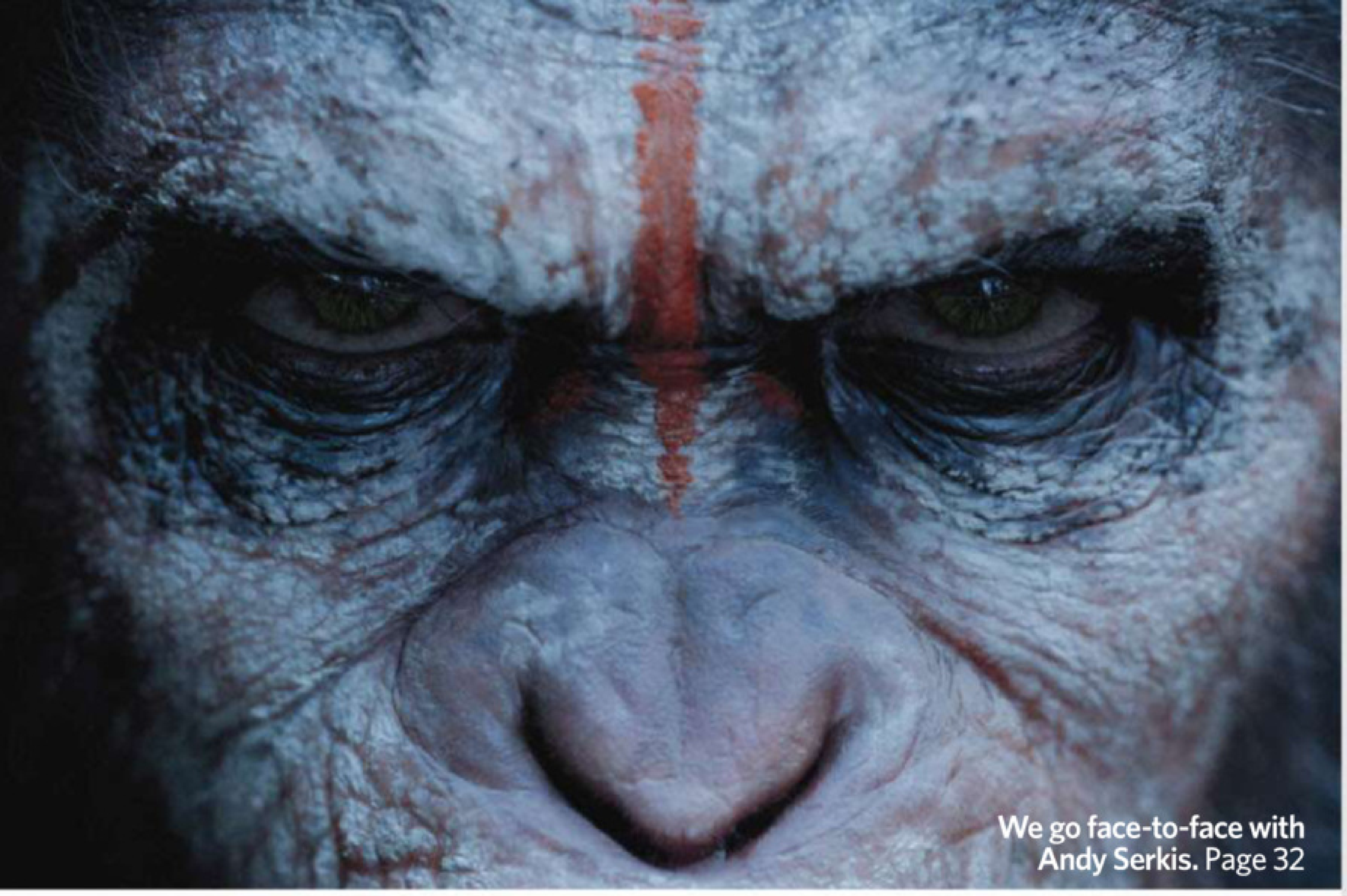
The Timeless Racer

The sleek, futuristic car you see gracing this issue's cover comes from Daniel Simon's beautiful new book, *The Timeless Racer*. The first in an ongoing series, the book considers the artistry of racing vehicles across a span of many centuries. It's certainly not to be missed. You can learn more at www.danielsimon.com

> "A strong design theme is like a melody in music that somehow sticks with you. It enables you to draw the vehicle with a few lines and it is unmistakably recognisable"

Daniel Simon discusses his vehicle design theories **Page 24**





Welcome

to the magazine and 116 pages of amazing 3D

Welcome to 3D Artist magazine! Daniel Simon's work with vehicles has never ceased to impress us. His latest release, *The Timeless Racer*, is full of such imaginative concept work that we decided to pick his brains about designing vehicles for film, videogames and beyond (p24). Elsewhere in the issue we go behind the scenes with Weta Digital on *Dawn Of The Planet Of The Apes* (p32) and take a look at the quickly evolving world of virtual reality (p42). Enjoy the issue!

Chris Editor

Every issue you can count on...

1. **Exclusively commissioned art**
2. Behind-the-scenes guides to images and fantastic artwork
3. **A CD packed full of creative goodness**
4. Interviews with inspirational artists
5. **Tips for studying 3D or getting work in the industry**
6. The chance to see your art in the mag!

This issue's team of expert artists...

Daniel Simon

The master of vehicle design goes in-depth on his workflow and techniques, starting over on p40

Gleb Alexandrov

Blender pro Gleb offers insight into his workflow for creating unique and memorable robotic characters

Alex Novitskiy

Alex shares his MARI texturing know-how, applying his techniques to a vintage WWII airplane model

Gustavo Åhlén

Gustavo kicks off a new series this issue, applying muscular anatomy to the head of a skeleton model

Jahirul Amin

It's the final of a series of four for Jahirul, as he finalises his cuttlefish project by animating the scene

Jared Krichevsky

Aaron Sims Company designer Jared looks at how you can use ZBrush masks to enhance your work

Chris Trill

Want to quickly and easily take photos for your own textures? Chris reveals his simple process in our Q&As

John C Martin

Reallusion's very own John C Martin offers some tips and tricks for easy animation using iClone's latest features

Andy Jones

You've pumped out your final render...what next? Andy discusses his top post-production techniques on p90

Pedro F. Gomez

Arnold expert Pedro takes a look at how you can combine XGen and Arnold to achieve some truly great effects

Dave Scotland

Maya 2015 is here! Dave puts his 15 years of Autodesk knowledge to the test with the new features on offer

Sebastian Stanek

RealFlow 2014 is here too! Sebastian of VFX company pixellusion takes a look at what the software can do

Sign up, share your art and chat to other artists at www.3dartistonline.com

3DArtist

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☏ +44 (0) 1202 586200
Web: www.imagine-publishing.co.uk
www.3dartistonline.com
www.greatdigitalmags.com

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Subscriptions
To order a subscription to **3D Artist**:
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☏ Overseas +44 (0) 1795 592951
Email: 3dartist@servicehelpline.co.uk
6-issue subscription (UK) – £21.60
13-issue subscription (UK) – £62.40
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13-issue subscription (ROW) – £80

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Printing & Distribution
Printed by William Gibbons & Sons Ltd, 26 Planetary Road, Willenhall, West Midlands, WV13 3XT

Distributed in the UK, Eire & the Rest of the World by Marketforce, Blue Fin Building, 110 Southwark Street, London SE1 0SU
☏ 0203 148 3300, www.marketforce.co.uk

Distributed in Australia by Network Services (a division of Bauer Media Group), Level 21 Civic Tower, 66-68 Goulburn Street, Sydney, New South Wales 2000, Australia ☏ +61 2 8667 5288

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Image - Chris Jones

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With over two million eyeballs on his YouTube "Eye Piece" animation (and Best of YouTube Channel selection to his credit), Chris Jones is shaking up the world of 3D CG with ultra-realistic human anatomy images that are straight up incredible. At the heart of this talented artist's pipeline is LightWave 3D.

"As a creative generalist I need to cover a lot of ground when working on 3D projects. LightWave enables me to do this without having to invest in a hodgepodge of expensive tools." – Chris Jones

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INSIDE ISSUE SEVENTY

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"Even everyday items like a litter bin can be a source of inspiration and reference!"

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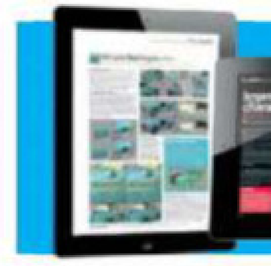

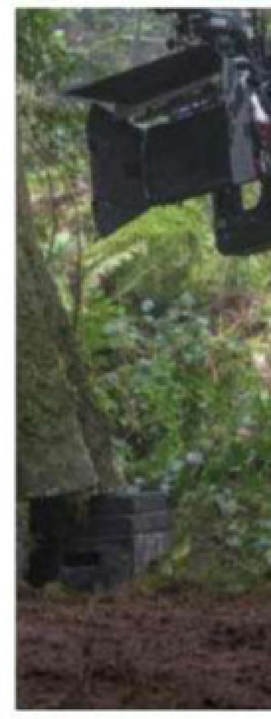

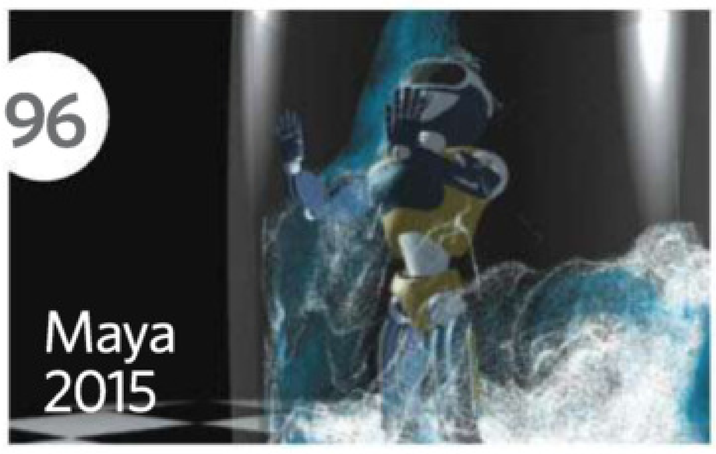

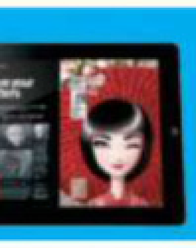

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“If you understand the logic of the texturing process here, then you will be able to apply it to any other projects you work on in the future”

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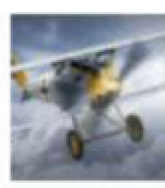
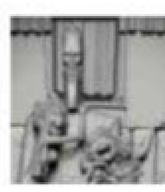


95 I Made This: The Count
Daniel Kho re-creates a smug 2D Dracula with the aid of ZBrush and Maya



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Turn to page 112 for the complete list of the disc's contents

The Gallery

Have an image you feel passionate about? Get your artwork featured in these pages
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> I was looking for a project to work on in my spare time that would be quick to model, but really interesting to texture. The iguana was the perfect subject – on the creature the scales need to flow nicely while also changing size, shape and colour

Justin Harris, *Orange Iguana*, 2014

Justin Harris

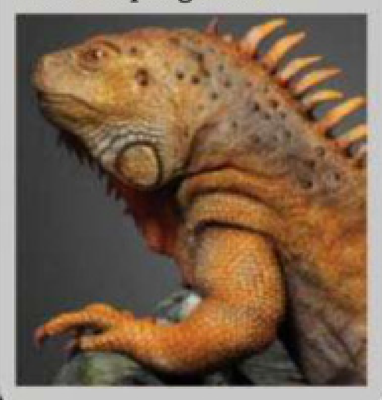
Justin in an Escape Studios grad, and is currently looking for work as a texture artist or modeller

Personal portfolio site
www.ju5tin.cgsociety.org

Country UK

Software used Maya, Mudbox, MARI, Photoshop

Work in progress...



kcpr raffaEl

3DArtistonline

Username: raffaEl

Personal portfolio
www.rendergarden.org

Country Poland

Software 3ds Max Design, iRay, Photoshop

Work in progress...

“This image was made as an entry for a design and advertisement contest for Morgan Motor Company. I wanted to show the timeless identity of the three-wheeler along with modern technology. The environment in which I placed the car reflects these ideas” **kcpr raffaEl,** *Morgan 3 Wheeler,* 2014

“For this piece, I planned to make a scene that was focused on showcasing a person’s inner emotional being”

Minjeong Shin, *A woman’s portrait,* 2014

Minjeong Shin

Minjeong’s interest in 3D started after watching *Star Wars*. She has been working in CG ever since

Personal portfolio
http://ofsinmin.com

Country South Korea

Software Maya, ZBrush, V-Ray, UVLayout, Marvelous Designer

Work in progress...

Mariano Steiner

Mariano is a freelance character artist working in cinematics, games, toys and advertising

Personal portfolio
www.marianosteiner.com

Country Brazil

Software ZBrush, 3ds Max

Work in progress...

> This is a sculpt of Mariuz Pudzianowski, five-times World's Strongest Man, MMA fighter, actor and singer. It's about 95 per cent ZBrush work and five per cent 3ds Max

Mariano Steiner, *Mariuz Pudzianowski*, 2013

Hew Yin Teck

This Malaysian-born concept artist is now working at Red Hot CG, based in China

Personal portfolio www.artstation.com/artist/yinteck

Country China

Software 3ds Max, KeyShot, Photoshop

Work in progress...

> I really like designing futuristic military stuff, though I try not to make my designs too hyper-futuristic. Instead I keep a balance between futurism and modernism

Hew Yin Teck, *Child Unit,* 2013

Farid Dridi

Farid is a freelance CG artist with six years of experience in the videogame and VFX industry

Personal portfolio
www.the-art-of-fareed.com
www.the-gfactory.com

Country France

Software Maya, ZBrush, Marvelous Designer 3, Photoshop, Quixel SUITE, Marmoset Toolbag 2

Work in progress...

"After reading the first volume of the *Blacksad* comic book, I became a big fan of Juanjo Guarnido's work. I made a 3D version of Poli, the boss of La Iguana pub, who appears in *BlackSad Volume 1*"

Farid Dridi, *Poli La Iguana*, 2014

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Introducing Blackmagic URSA, the world's first user upgradeable 4K digital film camera!

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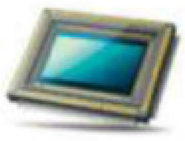

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Blackmagic URSA PL

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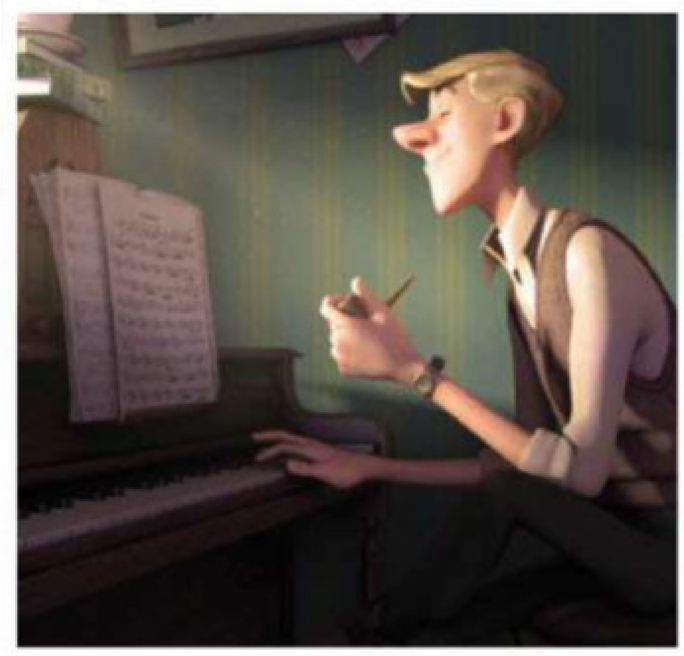
Blackmagicdesign

MAIN The winners of the CG Student Awards received a number of prizes to help them continue their amazing work, including Autodesk's Ultimate Entertainment Creation Suite, The Foundry's Production COLLECTIVE, a ZBrush 4R6 License and a Houdini Apprentice HD License

TOP *Roger* by Leticia Reinaldo, based on concept art by Disney. "I think figuring out how to manage my time between learning and practicing was my biggest challenge and my biggest success," explains Leticia Reinaldo
© Walt Disney Pictures

BOTTOM LEFT "I'd like to send a huge thanks to Gnomon and their awesome teachers and staff," says Chris Gillett, who has now started working as a full-time character artist in LA. "I came out of this experience feeling extremely grateful for everything I was able to be a part of in these last few years. Winning an award like this is just icing on the cake!"



The CG Student Awards winners

Seven winners from this year's CG Student Awards reveal how they created industry-standard work while still in full-time education

Adrien Lambert

www.adrien-lambert.com
VFX/Animation Student of the Year
School ArtFX: School of CG Animation and Visual Effects

"Working on the project 'Initium' during my last year at school has been key. I had to work on all different aspects of the film, from initially setting up the scenario, storyboard and concept to actually modelling, texturing, shading, lighting, and adding environments, matte painting and FX, then the final compositing. The deadline forced us to go faster, to find solutions and alternatives. Remember, don't be afraid of criticism – ask the opinion of your classmates and teachers.

When you work in Maya, you have to clear your history if you want to alleviate the strain on your scenes. The same can be applied to your mind: take breaks and go for a walk, go to the gym or read something. When you come back to your work, you'll have a fresh perspective on things."

Martin Lapp

www.martinlapp.de
VFX/Animation Student of the Year Runner-up
School Filmakademie Baden-Württemberg

"I had a huge amount of support from my family back when I started learning 3D. My mother always tells the story of me sitting in front of the PC in the middle of the night, knowing that I had a big test at school the next day. First she was angry, but as she saw how passionate and happy I was when I showed her what I'd just made, she let me carry on.

I also think it was very important for me to start studying visual effects at university. Creatively, it's a great opportunity and personal experience to work on your own projects. Last year, I took a year off and started working at Method Studios LA for six months. It was a fantastic experience – I learnt about working in a larger production environment on my first feature film (*RoboCop*) and also made some great new friends."

Servando Lupini

www.artofvando.blogspot.com
Next-Gen Gaming Student of the Year
School Gnomon School of Visual Effects

"If you are in a class, try to take advantage of that learning environment. If you run into problems or can't figure out how to do something, ask around. Someone in your school will probably know. That being said, you shouldn't rely on school being your only source of knowledge. You should always be on the lookout

for tutorials and new techniques that could improve your overall performance and complement what you learn at school. There is a lot of good information available on the internet and in magazines such as 3D Artist.

My final bit of advice is to try to do things that make you happy. It's much more fun to put your time and effort into projects that you really want to work on. Then, by the time you have to set up your demo reel, you'll have a more cohesive collection of quality work that you will be excited and proud to add to your portfolio."

Chris Gillett

www.cmgillett.com

Next-Gen Gaming Student of the Year Runner-up

School Gnomon School of Visual Effects

"When you're starting out with anything, whether it's 3D, painting, or playing an instrument, it always starts the same – being terrible. Those moments can test the identity you've given yourself. However, the things I've been able to achieve have always been through the same way– we live in a time where the idea of instant gratification exists more than ever, but everything takes work, and a lot of it!

Be sure to find a good source of education. This could be online or a physical course like I attended in person. Either way, do your research. Both can be potentially huge investments in time, effort and money. Then, learn from people who know what they're doing. Being a student is a humbling experience. Don't let your own ego stagnate your growth."

Leticia Kao

www.leticiakao.com

People's Choice Winner

School Gnomon School of Visual Effects

"The main challenge for me, apart for the financial challenge, was learning not to be afraid of taking risks and choosing the path that you know can change your life completely. A few years ago I couldn't see myself moving to a completely different country for over two to three years just to learn more about art and CG.

Getting to work on a feature animation film has always been my dream, but at the same time I know I could aim even higher and maybe even start my own studio or business. One thing I believe always lacked in my education process is knowing how to be a good businesswoman. I would love to know where to start and then learn how to keep it going. It's a must-have skill, in my opinion."

Leticia Tavares Reinaldo

www.leticiareinaldo.com

People's Choice Runner-up

School Gnomon School of Visual Effects

"Be sure to contact people that just finished a course at the school of your choice. I get emails from people thinking about going to Gnomon all the time and that's a great way to get some inside information about the system.

A portfolio project can be very scary in the beginning. Creating a list with the amount of objects you need will help you to know what to look for when collecting reference. You can then break your big concept into parts, creating the feeling of control over your project. The more you learn about your project in the beginning, the faster it will flow in the execution time. Learning to manage my time was the most important lesson of all that I learnt."

> "Do things that make you happy. It's much more fun to put your time and effort into projects that you really want to work on"
>
> **Servando Lupini**

Jonathan Lampel

www.be.net/jonathanlampel

NEW CATEGORY Young Guns Winner

School Cedar Park Christian School

"The main challenge that I face is seeing other artists' work and thinking that I will never be as good as they are. When starting out, it was difficult to stay motivated when I realised that my renders were simply not that good. I got better though, so it was encouraging to see each project turn out better than the last."

"Unfortunately I am not able to afford any of the art schools in the US, even with the generous amounts of scholarship that I was offered, but I will nonetheless be working hard to learn as much as I can in the next four years. Of course I'll also have to get ready for the 2018 CG Student Awards!"

TOP Adrien Lambert has wanted to be a VFX artist since he was a teenager. He tells us the 'Spider Robot' project was his first collaboration with Stephane Halleux, and truly allowed him to express his passion for 3D

MIDDLE *Pumpking* by Servando Lupini. Servando recommends making the most of your learning environment by communicating with your classmates and teachers, but also suggests working on your own independent projects to develop your knowledge

BOTTOM Martin Lapp's third year school project, 'Rugbybugs', was created as a trailer concept for the Stuttgart Festival of Animated Film (ITFS) as part of his curriculum. It later became the main trailer for this year's FMX. Lapp now works at Method Studios in LA

THE 3D ARTIST BFX FESTIVAL COMPETITION

We've partnered with the BFX festival to offer you the chance to win a huge variety of prizes!

This summer will see the return of the BFX Festival, Bournemouth's celebration of the very best in international animation, visual effects and videogames.

Boasting a packed schedule of workshops, exhibitions, lectures, screenings and recruitment and networking events, this year's festival is shaping up to be a centrepiece occasion for everyone with an interest in the creative arts.

To celebrate this event, 3D Artist is teaming up with BFX to offer students, hobbyists and professionals alike the chance to flex their creative muscles and share their skills to the world.

We invite you to create a single rendered frame based on a supplied screenplay of either *Frankenstein* or *Sinbad*. Each entrant will use their chosen screenplay as the basis for the creation of character or environmental assets.

You have total creative freedom, so you might choose to create a 2D concept design, a 3D model of Frankenstein's monster, or an image of Sinbad's ship rolling in the waves – let your creativity flow and show the world what you can do!

Next Limit's 2014 BFX Competition has already seen many teams of students use similar briefs to design a short sequence that they will go on to create later this summer, so why not be inspired by the work they have already produced? Check it out at www.bfxfestival.com/competition.

There are three categories, with two prizes for each. You will either be eligible for the professional prize or – if you have less than eight months of experience in the VFX industry – you can enter the hobbyist section. Entries will be judged on:

- **Character design/modelling**
- **Environment design/modelling/simulation**
- **Lighting and rendering**

All entrants must work individually – no team entries will be considered – and all entries must be in by 14 September 2014. Judging will take place during this year's BFX Festival by a panel of experts. To submit an entry, simply send it to 3dartist@imagine-publishing.co.uk with the subject line reading '3D ARTIST BFX COMPETITION'.

For full details on the competition, and to download the screenplays to get started, visit www.3dartistonline.com

The prizes!

Thanks to our sponsors at AMD, The Chaos Group, The Foundry, Next Limit and Pixologic you could win...

• An AMD W7000 • The Foundry's Production COLLECTIVE • V-Ray • RealFlow • Maxwell Render • ZBrush

To learn more about which prizes are available in each category and to learn more about the competition, head to **www.3dartistonline.com**

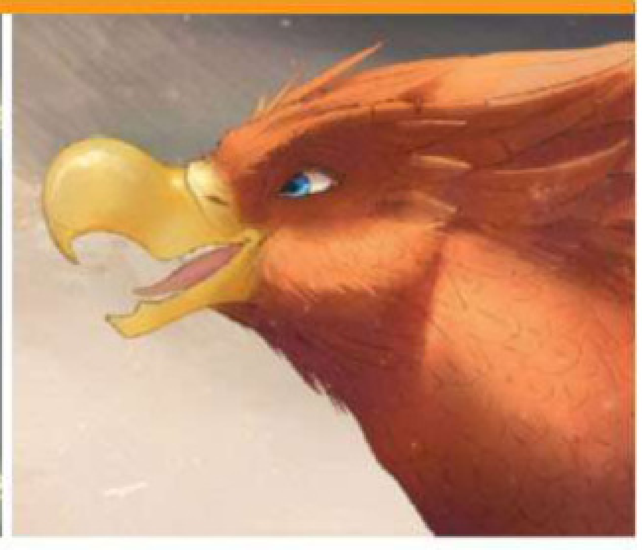
BFX Festival

The BFX festival will run from 24-28 September 2014 and is for anyone who shares a love of films, visual effects and animation. Confirmed speakers include Animal Logic, Framestore, MPC, Double Negative, ILM, Glassworks, Frontier Development, The Mill, Next Limit, The Chaos Group, AMD and The Foundry, with talks focusing on some of 2014's best films, including *The Lego Movie*, *Maleficent*, *Godzilla* and more.

Sofronis Efstathiou, BFX Festival director, said, "Whatever your age, profession or skill level, we would love to see your work. BFX is all about celebrating amazing creativity, so show off your skills, enjoy the competition and be in with a chance of some fantastic prizes!"

For more information about the Festival, and to find out about tickets, visit **www.bfxfestival.com**.

WIN! • AMD W7000 • The Foundry's Production COLLECTIVE • V-Ray • RealFlow • ZBrush • Maxwell Render



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A

Images of the month

These are the illustrations that have been awarded 'Image of the week' on 3DArtistOnline.com in the last month

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to view the art and chat to the artists

A Washed Ashore
» **Cynthia Decker**
3DA username Curious3D
Cynthia says: "Most of my artwork is colourful, so with this one I wanted to move away from that and explore detail and texture. As I was working, I kept flipping back into Photoshop and desaturating my textures. The more colour I took out, the better I liked the composition."
We say: *Sometimes playing around with effects in post-production can produce a completely different mood to that which you originally intended. Once you've finished with a render, always experiment with it a little!*

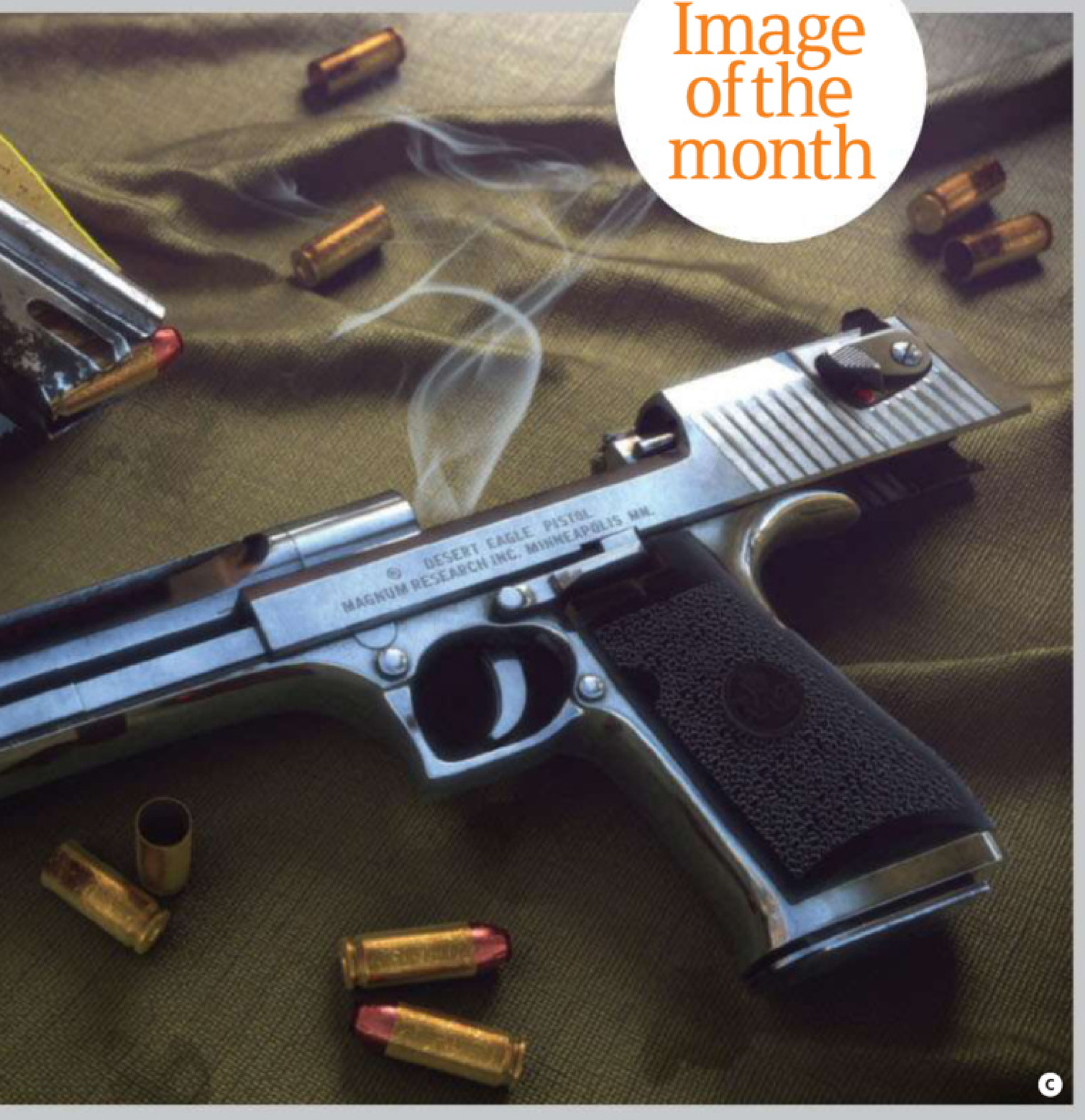
B Stylised Bust
» **Daniel Jack**
3DA username DanielJack
Daniel says: "This character was great fun. I pushed his proportions and facial structure to boost his expression. I sculpt a lot of these kind of quick doodles to establish character, and often use them as the foundations for the rest of the body/design."
We say: *Doodling in ZBrush is a great way to build your skills. You don't need to sit down to work on a full project from start to end, you can just toy with different ideas like Daniel has. Who knows what you'll come up with?*

C Matacacos
» **Alejandro Grassano**
3DA username artlexander
Alejandro says: "This scene was created for the Humster3D weapon render competition. It was modelled in 3ds Max, shaded in Maya, rendered in Arnold and composited in NUKE."
We say: *The smoking gun, the scattered cartridges and the dirty cloth all give this image a great sense of narrative. The work on the metal shaders of the Desert Eagle handgun are fantastic too, giving the image a very real feel.*

D Lake House
» **Rodrigo Mila**
3DA username Rodrigo_Mila
Rodrigo says: "Lake House is a personal project I started with the purpose to work on a mood I have never tried before. When I have the time to work on personal projects my aim is always to learn something new! I used 3ds Max, V-Ray and Photoshop."
We say: *The exact reason we selected this as Image of the Week on **3dartistonline.com** was because of its mood, so good work on that front Rodrigo! It's very reminiscent of rainy Sundays afternoons spent indoors, feeling cosy.*

B

Image of the month



Candles
» **Elena Montuschi**
3DA username Montuschi
Elena says: "I created this with polygonal and spline modelling in 3ds Max. Lighting, shading and rendering were done with Maya, rendering with V-Ray and colour correction in Photoshop."
We say: *Sometimes the most simple of objects, usually gone unnoticed in a day-to-day situation, can make a wonderful subject for a project. Just looking at these candles makes us think of past birthdays and eating too much cake!*

Royal Saber Snail
» **David Macias**
3DA username DavidMacias3d
David says: "My Royal Saber Snail. They can be found in damp caves, or sunbathing on mushrooms where light can be found breaking through the canopy. I created this using ZBrush and Photoshop."
We say: *That's quite an ostentatious shell for a rather downtrodden-looking snail! Great work on the texturing on his arms and body – it's exactly what we'd expect to see on a real snail.*

Penthouse 07
» **Leandro Silva**
3DA username leandrosilva
Leandro says: "The architecture seen in this image was developed by Domaine Public Architects. I used 3ds Max, V-Ray and Photoshop for this."
We say: *Clear, crisp and bright, this arch-vis image pulls you in with its use of light, pastel colours and blue skies. The sense of perspective – with the desk and lights stretching towards the window – also helps.*

UGR Soldier
» **Kieran McKay**
3DA username Keyz78
Kieran says: "This is some character work I did for the game *Beyond Flesh and Blood*, which is out soon. The model was rendered in Marmoset Toolbag, with the in-game mesh and textures."
We say: *This work just goes to show how great Marmoset Toolbag renders can look – it really is a great tool. For an in-game model these textures are fantastic. We love the look of the character's armour, and the glowing, piercing eyes of his helmet.*

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DESIGN AND CREATE

CONCEPT VEHICLES

If you want to learn a thing or two about car design – or even spaceship design, for that matter – look no further than the work of Daniel Simon

It goes without saying that Daniel Simon loves cars. A lot. Starting out as a car designer, moving on to become a vehicle concept artist, and now the author of a new book in which a driver travels through time to compete in the world's most exciting races; Simon's life is filled with a love for the form and function of vehicle design. The detail that's visible in his high-res renders are a testament to how fascinating the humble car can be. "The basic layout for a real car has not changed in 100 years: four wheels in four corners, four- to five-metres long, passengers in the middle, engine front or back, access from side, face with eyes and mouth," begins Simon. "Yet, there are thousands of cars that most enthusiasts can tell apart, some even down to the year. Imagine how these design opportunities exponentially grow by adding different vehicle layouts to the mix – it's an endless playing field." Getting his experimental fix by working for Hollywood and balancing this with traditional projects, Simon has a varied career. We met with him to discuss how he approaches his work, and to discover how individuality can still be found in an area as well explored as car design.

Simon certainly likes a challenge. "Ideas come from boundaries set by a design brief, and the desire to find a solution that only you could have come up with"

"I am rarely truly satisfied with a project and think I could have found a better solution. That motivates me on the next project"

"I love designing fantasy vehicles for specific past eras - like the 1986 Masucci X-6. Future is a relative term, and re-creating it from a past point in time is extremely fun"

Can you talk us through your workflow? What software do you use?

3D modelling has enabled me to create products that before I could only draw or imagine. I remember spending days on a single drawing, defining a highlight or radius. I started learning Autodesk Alias around 2002, and I became addicted to it.

RESEARCH I always begin with research for whatever I design. I never just start to draw random forms. How many people have to fit into the vehicle? What is its purpose? Who built it? Was it expansive or kit bashed? In which society does it exist? Shall it look neutral, aggressive or friendly?

SKETCH Next, I start to sketch. Either I draw on paper with a ball pen and illustrate shadows with makers, or recently, in Photoshop, by drawing on a darker canvas with a light pen blocking out the light areas. Sketching in Photoshop enables me to morph proportions as I draw. As a tip, try to draw on only one layer – it resembles classic media and keeps you focused. A side view is always good to have!

Once I see potential, even in a small sketch, I rebuild it in 3D in Autodesk Alias, using a side view as the main guide, sometimes even mapping the sketch onto the model right from the start.

I tried polygons a few months ago, but can't warm up to it and don't find time to study it in depth. NURBS work really well for what I do – we all have to choose our own tools and focus on the job.

PROPORTIONS If I see potential in a rough 2D/3D sketch, the true design work starts. I play a lot with proportions – on a wheeled vehicle that is mainly wheelbase, front and rear overhangs, position of the cabin, and height/width ratio. This is the make-it-or-break-it phase of the project. Details don't make a good design – it's all about the proportion of the volume. I have abandoned many concepts that I was originally in love with simply because I couldn't find a final stance that I was totally happy with.

DESIGN LANGUAGE Next would be the definition of design language. This helps build a common language with the client, with words like sleek, stealthy, Sixties, BMW-ish, lightweight-folded, utilitarian, bony, iPod, home-built or French (especially in automotive design, countries can describe a style, with French representing inventive and quirky, German cleanly organised, Italian slim and curvy, American bold).

RENDER CHECKS/TURNTABLES I render my Alias models every night in Bunkspeed Zoom and add notes to them as a to-do list for the next day. Very early on I add Color maps, mostly projections. They help to foresee the final result. Once a week I render a full-360 turntable in HD to study how the light runs over the shapes.

DRAWING OVER RENDERINGS I take renders back to the drawing board and sketch over them, either in Photoshop or with a pen on paper. I see no separation between 2D and 3D while I'm still in the design process.

PRESENTATIONS On average, I have three presentations per week to a client. It can be interruptive of a workflow, but is crucial part of a professional career. Skills to present, explain, and sell your ideas, and also to listen carefully and understand the client's needs, can be as important as knowing a piece of software or tool.

REVISIONS Revisions can affect you personally when you happen to fall in love with one of your ideas, but the client could opt for a different direction. Detach yourself and find energy to love the new direction just as much as they do.

NARRATIVE Clients often ask why certain parts are in certain places. It is fun to have an answer and even spark new ideas that may find their way into a movie script or game. I am working on a spaceship now for a videogame, and thinking about the layout of the floor plans really influences the hull design.

DETAILING Adding radii and fillets in NURBS is tricky at times, but necessary since each small highlight helps to bring the model to life. I also avoid Bump and Displacement mapping where I can. I just love a true math, especially when you prototype it.

MAPPING Most of my graphics are simple Projection maps. Decals, especially on glass, are decals in Bunkspeed. My maps are not larger than 6K. For close-up shots I re-create the area with higher resolution. I enjoy adding orange peel to paint via a subtle Bump map.

RENDERING As a passionate photographer, this is my favourite part. Bunkspeed imports Alias wires perfectly and I try to work in it as if I was on a real set. I still never create my own HDRI due to lack of time and usually use my three or four go-to HDRIs. I get as many adjustments done in Bunkspeed as I can, such as exposure, colour temperature and DOF and save all settings including all cameras (nothing is more frustrating than having a great render, but replacing a part of it later and having lost the camera angle or exposure). For reviews, I go with 3K, for refinements 5K, for final images I render 10K on NVIDIA GPUs.

PHOTOSHOOTS To place models with the vehicles, I measure the camera position in Bunkspeed and re-create the setting in a photo studio or outdoors. Matching the light and lens angle is crucial. I use similar environment colours to get realistic colour bounce.

POST It is helpful if I decide on a specific camera angle early on, because I can use the same Photoshop file for a long time and replace the render

Daniel Simon contributed many vehicle designs to the film *Tron: Legacy*

Simon is proud of his film work, but says, "The ideas for film vehicles come from directors, writers and production designers. I help to translate these ideas – mostly thoughts and words – into objects"

TEN TIPS TO GREAT VEHICLE CREATION

1 Make stance your first priority when designing wheeled vehicles

2 Always pay more attention to proportion than to detail

3 Find a strong design theme and hold onto it until the end

4 Apply the golden ratio to as many parts as you can

5 When you're designing a spaceship, work on it for a while with its belly up

6 Use partlines to enhance a section or to split up a surface in a cool way

7 Create hotspots for details – don't just spread them evenly

8 Avoid using real brands on your designs when you want to publish it

9 Always imagine impressing your future self with your current work

10 Give every part a meaning: it's fun and helps to build a logic to your design

Design and create concept vehicles

layer. All other details, like dirt, scratches, adjustment masks and so on can stay in place. Recently I've been working in 16-bit,and keep an RGB and an optimised CMYK file separate.

ARCHIVING & CLEAN UP I take some time to organise my digital archives and be thoughtful with file naming, starting them all with 'yymmdd_ projectname'. Files that I save quickly knowing I won't need them next time start with 'xxx', so a quick search every month helps to delete those.

Can you go into a little more detail about your concepting phase? How do you come up with these ideas?

Ideas come from boundaries set by a design brief, and the desire to find a solution that only you could have come up with.

It starts like this. For the *Oblivion* Bubble Ship, I was asked to combine a Bell 47 with a dragonfly and add a bright future feel. For the *Tron* Light Runner, they wanted to blend an F1 car with a 4x4 offroader and use geometric shapes. For the Masucci X-7 in *The Timeless Racer* I wanted to create a race car where air eroded through the shapes like water through the Grand Canyon, softened by a retro touch of a Porsche 917. Without a brief, there are no boundaries, and creativity gets lost. There are a million ways to merge a Bell 47 with a dragonfly, and every designer would do that differently.

Generally, I look for harmonious lines – sections that change along one axis – and I like primitive base volumes as a foundation. However, bold surface logic like that only works on conceptual vehicles where there is a lot of freedom. Automotive production design struggles with other problems; it is so locked in that designers are forced to invent crazier and crazier surface solutions to differentiate one car from another, which can result in absurd results. Some fascias become ridiculously complex; the cluster of headlight and side intakes in particular. If you study a 2014 Lexus GX SUV front end, you will see how things can go wrong.

How do you go about finding harmonious lines in your vehicle design?

Finding attractive and interesting shapes does not come easy if you want to be original. I studied shapes, volumes, form and proportion for four years at the School of Design in Pforzheim, Germany. After that, I worked for five years in an advanced studio of Volkswagen and later for Bugatti.

During those years I was surrounded by incredible creatives. It is, in fact, a shame that the public can never really see the talent that's hidden behind the secretive design studio doors. Most of my personal design heroes and role models are completely unknown to the public.

Why do you prefer NURBS modelling?

What I enjoy about NURBS is the control of large automotive surfaces and the ease of creating perfect sharp splines and crests. However, I do miss the free-sculpting abilities I see in polygons. I hope one day we will see tools that combine both seamlessly.

What is your post-production process?

For print images it is a terrifying process. I try to do as much as I can in the 3D render and reduce post to a minimum. It may sound like a bad idea, since post can be very efficient, but that changes when you have clients that get used to the freedom of 3D. Take a racing vehicle: if you add all sponsor decals in post, you not only have to struggle to achieve the perfect perspective with Photoshop's Distortion tools, but you end up with only one shot. If you invest more upfront and include them in 3D, you have them correct at any angle. Clients tend to ask for an extra view that you didn't expect, so my racing cars have highly complex high-res maps and dozens of decals that I can move around to change the finish.

What did you learn from your experience designing real cars, and how has this impacted your work today?

What I learnt from my car experience is the respect for the complexity of curved surfaces. As I remember from a conversation with the great Syd Mead, a car is simply a sculpted mirror reflecting its environment. You cannot hide any imperfections in a reflection, unless you put a feature right there to cover it up. That is the reason why minor adjustments on automotive shapes take a long time.

The other thing I learnt is the importance of a theme. A strong design theme is like a melody in music that somehow sticks with you; whether a producer tunes it into country or RnB, that melody is still great. The same goes with design. The easiest way to describe it is that it enables you to draw the vehicle with a few lines and it is unmistakably recognisable. Finding those iconic bits is very difficult but rewarding, and it will be the thing that survives all design revisions and carries the project through.

How does working on a brief for a big Hollywood production differ to creating your own vehicles from scratch?

It's like comparing football to tennis. It comes easy to say 'we played badly' when the team did not play well. Was it the coach? The defence? The guy who missed the penalty kick? In tennis, it's one person on the court, all eyes on him – no excuses. It is the same in design and I gravitate always to the pressure of creating something from scratch and being totally responsible for it.

If you work for hire on a film or a game, the lines get really blurry about who the true creator is as it's a massive team effort. The concept might come from the director and the designer gives it a shape. If you get lucky, like me recently on a videogame project, the studio asks you to come up with some concepts from scratch and one of them makes it all the way through to the final product under your control. That's a great feeling for a creative.

I like the mix of both – working with a team and working by myself. If you work too much by yourself, you lose a great opportunity to be inspired by others, to learn and progress, and to enjoy social interaction. If you only work in teams, you might miss a chance to truly discover your own abilities and voice.

Simon mixes commissioned work with personal projects. "If you work too much by yourself, you lose a great opportunity to be inspired by others. If you only work in teams, you might miss a chance to truly discover your own abilities and voice"

Which of your many high-profile projects has been the most challenging?

They are all fairly challenging in their own way, but here are a few examples:

■ ***OBLIVION* BUBBLE SHIP SEATS** Designing and modelling the Bubble Ship for *Oblivion* was challenging because we had to truly build it. A glass sphere is as simple as it gets in CG, but as complicated as it gets in true manufacturing. The way were able to cut the real, modelled sphere ruled the design; as did having a real actor have to board the ship, not hit his head, and be comfortable on a eight-hour shooting day in the seat design. We also had to imply engineering data for door mechanisms, seals, stiffnesses, or structural requirements, which could mean weeks of tedious redesigning. Simple, clean designs are the hardest to maintain through a development process, as a cluttered design can always hide a bump or groove here and there without anyone noticing. In total, I believe I modelled the entire Bubble Ship about ten times.

■ ***TRON* LIGHT JET** *Tron* was challenging because it was my first big movie involvement and I had to learn a lot about the workflow and trade language, while proving myself to the people who brought me on board. The sheer amount of vehicles we had to design was overwhelming, and even today I have some nightmares about the large Light Jet. The scene in the cockpit was rewritten a few times in the script, hence our design had to change. The connection from the main cockpit to the rear turret was especially tricky, but in the end we don't see much of it in the final film.

■ ***THE TIMELESS RACER*** Creating your own IP is creatively fulfilling but logistically exhausting. I was constantly out of my comfort zone. Challenges include self-motivation, motivating collaborators, bookkeeping, legal issues, writing and funding. Cars are harder to create than fantasy machines, since the audience is very critical and knowledgeable.

Tell us more about the world of* The Timeless Racer *– where did you get the idea to create an entire fictional world?

Vehicles need context. A Ford GT40 looks cool by its design, but few would really know about it, if it weren't the British-American car that beat Ferrari. Now, I like to collect books about cars, and one day I wondered how it would be for a guy in the year 2300 to buy a book about Ferrari or Porsche, if both the brands and books still existed. Would it be three times as thick? Or would the models that are your favourites not even be mentioned because so many crazier vehicles would have emerged in those 200 years? Those thoughts sparked more questions. Will there still be motor racing in 100 years, when autonomous cars can put down a perfect lap time all day? Will people in racing overalls feel like gladiators and become a cool, retro thing to go do on Sundays? How much longer will winners pop champagne on the podium? Would they still do that in 2300?

It frustrated me that I will never find out, so I decided to create the kind of books I have on my shelves about racing, but about a fictitious team that

Design and create concept vehicles

Simon sketches a great deal before bringing his ideas into Alias. "Once I see potential, even in a small sketch, I rebuild it in 3D in Autodesk Alias, sometimes even mapping the sketch onto the model right from the start." He renders his final images in Bunkspeed

existed for over 699 years, from 1916 to 2615. I called that team Masucci, after my wife's grandfather. The book's hero, Vic Cooper, wants to follow his father's path and be a Masucci racer too. He embarks on a time travel adventure over seven centuries to race them all – cars, planes, boats and space machines.

This story framework allowed me start on design, and as a car nut I started with endurance racing. These machines are gorgeous and fast. The Masucci X-6 design is inspired by the racing beauties of the Eighties, and some fun gadgets like the rear fan are homages to true and crazy inventions. I designed each car in Alias, and then seeked the help of my friend Joe Hiura. In SolidWorks, we added material thickness, radii and hundreds of true screws. IGES and STEP formats enable the dialog between the two softwares and Alias is also the package of use at the workshop that mills test prototypes. I had the Masucci X-7 roughly milled in 1:4 scale and taped the graphic lines on it. I found the roof too round and went back into 3D to modify the section.

All images were rendered in Bunkspeed at a massive 10K and retouched in Photoshop 16-bit. For final print files, a separate set of images was created in CMYK, which is a science by itself. A basic understanding of it really helps.

What were the biggest challenges you encountered when working on the book?

Like with fresh, homemade pasta, you can easily miss the perfect al dente moment and ruin the entire experience when you don't know when to stop working on an image. If you're not careful, you can overcook it and therefore compromise the way that your design is represented.

If you tap into photorealism, those issues amplify because there is something unsettling to the observer if an image is 95 or 105 per cent realistic. We all know those moments in a movie or TV show where a creature or a ship looks just a notch fake, and most cannot explain why. This five per cent window around the reality sweet spot can be a pain to achieve and I sometimes fail at it.

Another time factor is comping in real models. The photo shoots can take a lot of time to organise, including the model, the wardrobe, the location and the right lighting, colour and angle match. Some key images take me up to one month on and off with a dozen lighting variations and adjustment layers, and at 10K resolution there is a lot to go wrong. It took 4,500 hours to complete *The Timeless Racer*. To keep it within a reasonable price range, I had to chose between page count and book size. I decided for size. It's almost a poster book, so that readers can enjoy the amount of detail.

Do you plan to add more to the series?

Absolutely. I am obsessed with the idea of seven centuries racing heritage and have many ideas in my head. I will only be able to sleep well once those ideas find their way onto paper or screen. Next up is air-racing. I have always been fascinated with the beauty of speed planes, and a close-up experience at the Reno Air Races last year only further amplified that passion. Since the number 13 has some meaning in this series, 12 more episodes should be the ultimate, outrageous goal.

Finally, can you tell us a little about your next project, DSX?

I like to build labels that help me to organise the creative chaos. *Cosmic Motors* is a space opera, and *The Timeless Racer* an earthly racing saga. Both are stories full of fantasies.

However, I am also very interested in conceptual product design that is related to the real consumer world. *DSX* is an abbreviation of Daniel Simon X, with the X standing for Experimental, Exclusivity, Luxus, and Extravagance. Simply put, high-end lifestyle products that use existing technologies. They are virtual concepts only, but have potential to be developed further into a real product.

THE TIMELESS RACER

Simon has released *The Timeless Racer* in three different versions. There is the Unlimited Edition, the Limited Edition (of which there are only 1,113 copies worldwide) and the Pitlane Club edition (of which there are only 313 copies). They are all 12 inches by 14 inches oversize with full-spread images spanning about 24 inches in width. It tells the story of racer Vic Cooper, who travels through time to compete in different races. The first edition set in the year 2027 and covers endurance racing. Written in English, French and German, Simon estimates that he's put 4,500 hours of work into the book. The Unlimited Edition is the basic version of the book, while the Limited Edition comes in a slipcase and has a unique cover design of the Masucci X-7A with an open engine. The even snazzier Pitlane Club Edition comes with a personalised aluminium plate, a print, an original sketch and more. For further information see **http://danielsimon.com** or **www.designstudiopress.com**

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THE MASTERS OF VFX

WETA DIGITAL

DAWN OF THE PLANET OF THE APES

We talk to Andy Serkis and Weta Digital's Dan Lemmon, Daniel Barrett, and Florian Fernandez about the process of transforming a human into a fully believable ape

Daniel Barrett
Animation supervisor
Weta Digital

Florian Fernandez
Models supervisor
Weta Digital

Dan Lemmon
Visual effects supervisor
Weta Digital

Andy Serkis
Actor, co-founder
The Imaginarium

All images courtesy of Twentieth Century Fox

For this film we had to come up with new technology to use our equipment – which was normally used in dim studio environments – and take that out into the bright daylight

DAN LEMMON

The masters of VFX: Weta Digital

As well as the thousands of ape characters, the Weta Digital team also had to create a post-apocalyptic San Francisco and other assets such as horses and props. Interestingly, no real apes were used whatsoever in the making of the film

Two decades ago, a film where half the cast was CG would have been unheard of. Today, thanks to innovations such as Weta Digital's work on *The Lord Of The Rings* and *Avatar*, it's a reality

Believe me, the artists at Weta know my face very well by now!" Andy Serkis is sat with **3D Artist** following a *Dawn Of The Planet Of The Apes* screening in London, thinking about how much time Weta Digital has spent staring at his features, and how the technology has advanced. "When I worked on Gollum, my performance was filmed on 35mm film: a thing of the past. Back then, the animator's job was to – with great skill – represent my facial expressions frame by frame through key-frame animation. However, when we started to work on *King Kong*, it was the first time they really used facial capture in the sense that my markers combined with a direct drive system to let my facial expressions also drive the digital puppet in a scene. Then, films like *Avatar* happened and it all became really standard industry practice. It's been amazing to see it evolve and I've been lucky enough to play some great parts along the way."

A few months before our interview, Serkis – who plays lead ape Caesar in the upcoming *Planet Of The Apes* sequel – had sparked an online debate about the final authorship of a motion-captured character. Even *Lord Of The Rings* director of animation Randall William Cook stepped in to criticise Serkis for stating that animators were essentially painting "digital make-up" onto an actor's performance. When talking to **3D Artist**, however, Serkis is clearly full of respect for the process – both on the acting and animation side. It's only to be expected after more than a decade of pioneering work with motion capture and even co-founding his own studio, The Imaginarium.

However, in *Dawn Of The Planet Of The Apes* the emotional content of the acting performance drove the animation more than ever, thanks in part to new technological developments that allowed for multiple actors to be mo-capped directly on set and in broad daylight. With 2,000 ape shots in the film, newly appointed director Matt Reeves was determined to use the technology to help beat the uncanny valley effect. He aimed to base every movement and emotional expression on the real actors' performances, and even hired parkour experts for climbing scenes so as to require as little pure digital double work as possible.

Together with Weta Digital – who expertly crafted the apes from the skeletons to the flakes of war paint on their fur – Reeves has crossed the uncanny valley with grace. The animators certainly aren't just painting digital make-up onto the actors' performances, but despite Serkis' unfortunate phrasing it's easy to see what he meant. The artistic touch of the animator is now more tightly intertwined than ever with the emotional element of acting. The result is a true partnership of performance and technology that's driving the cinema experiences of the future.

The numbers of Dawn

- *Dawn Of The Planet Of The Apes* is set **10** years after the *Rise Of The Planet Of The Apes* film.
- **15** ape performers needed to not only act out their roles, but to go back and shoot all the other thousands of apes in the community.
- There are **11** hero ape characters and an army of over **1,000** apes. Combining texture variants and **95** unique fur grooms Weta Digital created **504** unique ape costumes.
- Caesar has **820,093** strands of fur, including eyelashes, facial hair and peach fuzz.

NEXT-GEN MOTION CAPTURE

"I guess for us at Weta it was an opportunity – we'd just finished *Avatar*, which was a big film, and we

LEFT For *Dawn Of The Planet Of The Apes*, the team upgraded its motion capture technology to be able to shoot an actor's performance outdoors. Several actors could also be mo-capped in the scene simultaneously

RIGHT Poster for *Dawn Of The Planet Of The Apes*. Facial mo-cap technology was used in combination with Weta Digital's latest update to its facial animation system

> When we started to work on *King Kong* it was the first time they really used facial capture, in the sense that my markers combined with a direct drive system to let my facial muscles also drive the digital puppet in the scene
>
> **ANDY SERKIS**

were looking into what would be the next big thing." Dan Lemmon, visual effects supervisor on *Dawn Of The Planet Of The Apes*, remembers talking to Fox about scripts, with one standing out in particular. "One of the things that they mentioned that was coming up was a reboot of the *Planet Of The Apes* franchise, which for VFX people is a little bit like a dream come true – it's one of those classic sci-fi films from many of our childhoods, and the idea of being able to revisit that franchise and breathe new life into it was really attractive."

Weta Digital's work on the first *Rise Of The Planet Of The Apes* film earned the team two VES awards, the top prize for outstanding visual effects in a visual effects-driven feature, as well as nominations for both an Oscar and BAFTA for visual effects.

Soon after, Weta had the opportunity to continue its work on the sequel. "We really were trying to build on our successes from the first film," continues Lemmon. "For instance, it had been the first time that we'd ever taken performance capture out onto the location sets. However, the main enemy on the first *Apes* was still sunlight, so for this next film we had to come up with new technology to be able to take our equipment, which was normally used in dim studio environments, and truly move it out into the bright daylight."

Set ten years after *Rise Of The Planet Of The Apes*, most of the world's population has now succumbed to the virus that was created in a lab along with the intelligent apes, and Caesar's new utopian society thinks humans are all dead, until a small group invade the ape's territory searching for power. The new setting meant that, unlike *Rise*, the majority of *Dawn Of The Planet Of The Apes* was shot largely outdoors in the rain, sleet, snow and mud. As such, the expensive equipment had to be robust enough to deal with the elements.

Despite the inherent difficulties in shooting outdoors, it was thanks to Weta's new adjustments that a next-generation motion capture pipeline was born: one in which more than six actors' performances could be motion captured at the same time right on location, no matter the weather. The actors could therefore truly play off each other in a genuine location, improving not only the motion-captured performances of the apes, but also those of the human characters on the live-action plates. When shooting *Lord Of The Rings*, Serkis would have to return to set a year after the other actors had left to reshoot his motion-captured scenes. With *Apes*, once the scenes were shot on set they were done, and Weta Digital would have much more than just eye-line references or an inspiring soundtrack to work with.

ANATOMICAL ACCURACY

Before any of the animation work could be completed, the team had to first build a community of thousands of fully CG apes that would be able to look and move like they were real. Moreover, with the apes becoming ever more human, a more anatomically correct skeleton was required for each character, as well as an enhanced facial animation system made up of a massive network of blend shapes – perfect to cover a full range of emotions, and even whole sentences of dialogue.

Of course, Weta Digital had already worked on the assets for *Rise Of The Planet Of The Apes*, so they were off to a good start. "We had a lot of our hero characters in place and we were able to pick things up where we'd left them," begins models supervisor Florian Fernandez. "Still, a lot of our main characters had to be redesigned for the second movie because ten years have passed, so we were showing the aging on the characters' faces."

Using a combination of both Maya and Mudbox, the modelling team also needed to strike a subtle balance between what was human and what would still be ape, revealing the evolutionary progression of the characters. To do this, they looked to our common ancestors, studying exactly how prehistoric ape-humans were structured. The most evolved ape – main character Caesar – would ultimately have the most human-like skull shape and ear positioning, whereas others, such as Kobo, would look more like chimps.

"In *Dawn*, a big thing was that all our hero characters have lot more resolution on their faces," reveals Fernandez. "Probably about half of the polygons overall will have been used in the face." To ensure the apes could move their faces and speak convincingly, Tissue was put into use: an in-house muscle system that was originally conceived for the production of *Avatar*.

The masters of VFX: Weta Digital

"Our muscle system is mainly driving the body musculature, and then we also have a facial animation system which is mostly driven by a combination of both blend shapes and a secondary layer of simulation on top of the faces," Fernandez explains. The hundreds of shapes would represent all the muscles of the face, as well as allow for many detailed in-betweens to be calculated. Even something as seemingly simple as an upper lip raise would be made up of not one blend shape, but a combination of them. "All the wrinkles you see that come and go and the muzzle of the apes – they were pretty much all hand-sculpted," continues Fernandez. "These were then dynamically driven in a simulator by our muscle system so that when the apes talk, the overall motion of the muzzle is compressing the volume in a completely physically accurate way."

However, an even bigger challenge for the team came in creating the ape's fur. With almost half the film playing out in the rain, the apes needed to look realistically wet, down to details such as fur clumping together correctly or beads of water forming realistically on top of it. "For the second movie, our characters have now been living in the woods for ten years, so they're really weathered," says Fernandez. "We had clumps of mud, we had props, paint flakes, blood – we had everything! The modellers went in and basically placed every single one of those details in with a paint distribution system, and there were also lots of different grooms that were being sculpted on top of that. Caesar, for instance, has a variety of groom costumes that he uses throughout the movie from wet to dry to damp, or war paint to wounded. We pretty much went to town, trying all kinds of ideas and directions to make sure it all worked and it wasn't just a fantasy creature that we were making up!"

BRINGING THE APES TO LIFE

"You know, in the past we were kind of the computer geeks that were getting in the way of the live action, but on this film the whole crew were all incredibly supportive and sympathetic to our needs and it made it a very successful shoot," remembers animation supervisor Daniel Barrett. "Of course, at the heart of the film were the actors, certainly in the case of Andy – what we do is aim to match his performance so he's right in what he says, but the common misconception these days is that we can take that performance and push a couple of buttons and the final product just comes out at the other end looking spectacular!"

In fact, collecting the actors' motion-capture data on set was just the beginning. Afterwards, Weta Digital's motion-edit department would need to translate the human performances onto the proportions of the ape models that had been created. All the facial markers, for instance, passed through a solver – essentially an algorithm that decided exactly what muscles on the ape's face would be firing based on each tiny movement in the actor's facial markers during the shoot. These movements would then be given on to the facial animation department who would use them as the first blocking pass.

"The data was something that got us ahead quickly," acknowledges Barrett. Even with it, he explains that the animators still needed to take command on occasion. "Every now and then, the data could be patchy depending on whether there were issues with occlusion or weather, so we set up a lot of reference cameras – at least eight, depending on the performance. We were referring back to them, especially when it came to facial. The solver does a good job of laying down basic stuff, but to get that final performance we studied references for days."

Other times, the animators would need to get hands on to make the apes that little more ape-like

The facial motion capture for the actors was driven by a combination of both blend shapes and a secondary layer of simulation on top of the faces. Animators would ultimately try to match the performance of the actors with help from a set of reference cameras

We pretty much went to town, trying all kinds of ideas and directions to make sure it all worked and Caesar wasn't just a fantasy creature that we were making up

FLORIAN FERNANDEZ

The masters of VFX: Weta Digital

"There is no magic button, we're basically looking at reference and doing what animators have done for years, which is animating a performance of a character based on the reference of an actor performing," explains Barrett

– after all, humans are humans, and apes are apes. "All the actors, they are our templates – we don't deviate from those emotional performances, begins Barrett. "The audience is looking at chimps and won't understand their facial expressions, but they understand humans' and I think it's really important for the story that we're matching that.

"Nevertheless, as animators, we're translators. We have a human performance – but the human is playing an ape that has a different face, a different body. We're trying to stay true to apes as well as the performances of the actor." An important example, he reveals, was the creation of an ape's quadrupedal walk. The actors had replicated it with strapped on arm extensions, which would result in unrealistic movements when applied to a CG ape. "In those types of cases, we intervene," Barrett continues. "Using plenty of references from the wild or zoos, we chimp or gorilla them up!"

> As animators, we're translators. We have a human performance – but the human is playing an ape that has a different face, a different body. We're trying to stay true to apes as well as the performances
> **DANIEL BARRETT**

Like most animators, Barrett doesn't feel threatened by the idea that the mo-cap technology could eventually render his craft obsolete. "As an animator I'm a huge fan of motion capture," he reveals. "Getting that data gave the animation team a lot more time to concentrate on the things that we like to be concentrating on, and I think what we're going to see is a lot more actors willing to take on these roles, even if their faces won't necessarily appear on screen, because they have confidence that what they're doing will be honoured. I think it's the only way to go for the future, really."

Serkis agrees. "I think now with young actors coming out of drama school, they don't bat an eyelid, it's industry standard to them because they've grown up with films like *Lord Of The Rings*, and I think it will continue to proliferate." With both VFX and motion capture working together in unison, he states, we are developing a major tool that is changing the future of storytelling.

As the lines blur between actor and artist and the uncanny valley starts to feel more like an uncanny crevice, our cinema experiences are sure to change, growing ever more exciting with each new blockbuster release. There's a new liberty in it for the actors too, despite the expensive mo-cap equipment that they're required to wear. "It's the liberation from your size, your colour, your sex," Serkis concludes. "In *Dawn Of The Planet Of The Apes*, female actor Karin Konoval plays Maurice the orangutan, who is a male character. Today, it doesn't matter who or what you are, as long as you're the perfect person to play that role. That's the great freedom of it."

Weta Digital's pioneering motion-capture history

1993 Weta was formed by a group of young New Zealand filmmakers including Peter Jackson, Richard Taylor and Jamie Selkirk. Later on, it was split into two specialised halves – Weta Workshop and visual effects studio Weta Digital.

1994 Peter Jackson's *Heavenly Creatures* is released. It was one of the first projects for which Weta Digital provided visual effects.

2002 Weta Digital earns its very first Academy Award and BAFTA for best visual effects for *The Lord Of The Rings: The Fellowship Of The Ring*.

2003 Andy Serkis's Gollum becomes a pioneering example of a motion-captured character in a feature film for *The Lord Of The Rings: The Two Towers*. The work on Gollum contributes to Weta Digital earning an Academy Award and BAFTA.

2004 Weta Digital earns an Academy Award and BAFTA for the VFX in *The Return Of The King*, and senior VFX supervisor Joe Letteri wins a Technical Achievement Academy Award for the sub-surface scattering technique first implemented on Gollum.

2006 Weta Digital added facial tracking to its motion capture setup, again capturing Andy Serkis but this time as King Kong. Weta receives an Academy Award and BAFTA for Best Visual Effects on *King Kong*

2010 Weta Digital works with James Cameron to usher in new era for motion capture for *Avatar*. Actors wore tiny video cameras attached to headrigs that were used to capture detailed facial performances. The facial and body motion capture data could be roughly determined in real-time, allowing for a low-resolution preview of the scene. The simulcam system was also developed at this time by James Cameron's Lightstorm, allowing playback of CG characters composed on top of the live action being filmed. Weta Digital receives an Academy Award and BAFTA in Best Visual Effects for *Avatar*.

2011 *Rise Of The Planet Of The Apes* and *The Adventures of Tintin* are released in the same year. Weta Digital receives an Annie Award for both, and two Visual Effects Society Awards for *Rise Of The Planet Of The Apes*. Both highlight the flexibility of mo-cap as a tool for fully animated films as well as live action. *Rise Of The Planet Of The Apes* marks the first time mo-cap technology could be used outside, as apposed to strictly in a studio.

2012 *The Hobbit: An Unexpected Journey* is nominated for a Visual Effects Academy Award and BAFTA. Gollum is revisited and this time the performance is captured on set. Mo-cap for the trolls is done on set at the same time as live action, and again later in the mo-cap volume. Barry Humphries' performance for the Great Goblin and Manu Bennett's for Azog are also captured on the mo-cap volume.

2014 *Dawn Of The Planet Of The Apes* is released

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Tyler Russo

Website milkingthevoid.tumblr.com
Country USA
Software used ZBrush, CINEMA 4D, KeyShot
Bio Tyler is a self-professed fictional character who "attends CalArts and draws images that don't exist"

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Panoramaoid Androids 2014

I really love the potential ZBrush has as a tool for making concept art. It's so easy to explore how a character might look in different lighting setups, and the obvious advantage of having a concept viewable from multiple angles is a definite help when attempting to communicate your idea to others. I would encourage any concept artists out there who haven't yet explored concepting in 3D to give it a try.

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THE VIRTUAL REALITY REVOLUTION

With the dawn of fully immersive VR occurring all around us, we talk to the 3D artists creating the new experiences of tomorrow

It was 2010, and the soon-to-be founder of Oculus VR, Palmer Luckey, had just announced the existence of his first virtual reality device prototype to Meant To Be Seen's online discussion forums. He had spent his teenage years collecting more than 50 of the world's head-mounted displays to try out virtual reality for himself, yet remained disappointed with the lack of the true immersion they had promised.

Even then, VR technology was by no means new. In the late Fifties, Morton Hellig invented the Sensorama, a simulator resembling today's arcade machines that combined video with audio, wind and even smells. In 1965, grandfather of computer graphics Ivan Sutherland – who invented a program many see as the ancestor to CAD, Sketchpad – created his own stereoscopic head-mounted display, The Ultimate Display. However, Sutherland later recalled that there was no way could ever realise the extent of his vision for the HMD. Though the project was a catalyst to getting more people interested in the technology, true VR was still impossible in the Sixties.

Despite the decades that had since passed, Luckey had also encountered many problems with the available hardware. Images would be too blurry, a narrow field of vision meant the black edges around the screen were still visible, and crucially the high degree of latency between a user's head movements and when the images on screen caught up would make them feel sick. Anything more advanced would cost $20,000 or more and be developed specifically for military or scientific purposes. Nevertheless, Luckey had the determination to find a solution.

He set about developing his own HMD in his parent's garage, and after garnering the attention of creator of *Doom*, John Carmack – who brought the prototype to E3 in June 2012, and an impressive team of industry specialists to work with – the 19-year-old became the founder of Oculus VR Inc.

By 2012, Luckey and the company were about to launch a Kickstarter with a funding threshold of $250,000 for its first product, the Oculus Rift. The early Rift developer kit offered ultra-low latency head tracking, a 110-degree diagonal field of view and a resolution of 1280 x 800. When it was ultimately funded $2,437,429, it was clear a sea change was coming. With Sony announcing Project Morpheus and Framestore now launching its own VR studio, Oculus had paved the way for high-tech virtual reality to become an actual reality.

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The virtual reality revolution

OCULUS VR

Since Oculus VR's campaign, Luckey has become somewhat of a celebrity in the tech world (to say the least), and Oculus VR has gotten all the bigger for it. Co-founder of Naughty Dog Jason Rubin and lead engineer behind Valve's VR project, Atman Binstock, are recent additions to the team, and Carmack himself even decided to leave id Software – which he co-founded in 1991 – to become Oculus VR's chief technology officer. In March this year the company launched the Oculus Rift Development Kit 2. Then, in the very same month, the announcement came that the whole company had been bought by Facebook for a cool $2 billion.

The move alienated both fans and Kickstarter backers, such as Minecraft creator Markus Persson, who promptly announced that the game would no longer be developed further for the headset. Still, Luckey, Carmack and others in the team were enthusiastic enough about the acquisition to reportedly reinvest percentages of their own equity in it for a five-year period, and the backing from Facebook does mean that the Rift can now be developed to perfection, with money for it's own custom hardware and without the pressure to turn a profit as soon as possible to survive.

"One of the reasons virtual reality is so challenging to work on is because we're far away from where we want to be," explains Luckey. "We have something that's very impressive, but what we really want is for virtual reality to be indistinguishable from reality itself." The Development Kit 2 only proves how far VR has come towards this aim. Instead of the earlier versions' LCD displays, it uses OLED screens with a response rate of less than a millisecond to help eliminate judder and motion blur. It also integrates a low-latency positional head-tracking system using an external camera, and the screen resolution of 640 x 800 per eye once featured in the Kickstarter has been updated to a high-definition 960 x 1080 per eye. The simulator sickness that was once so infamous with virtual reality is quickly becoming a thing of the past.

"This is the first time that tech creators are really starting to make lots of different demos and different games that utilise virtual reality instead of just talking about it," beams Luckey. "That's been one of our biggest successes."

SONY PROJECT MORPHEUS

At the very same Game Developers Conference that first introduced the Oculus Rift Developer Kit 2 in March 2014, Sony also made a huge announcement – its very own virtual reality headset system for the PlayStation 4, Project Morpheus, was now officially in the works. Though the project was announced years after the Oculus Rift, Sony is definitely not new to head-mounted displays. For instance, a pioneering piece of technology in 1997 was Sony's Glasstron, a personal LCD monitor that included two LCD screens and earphones for video and audio, and in later models, even a see-through mode that allowed users to view the surrounding environment by adjusting the transparency of the viewing screen.

"My background before I came into the gaming industry was from simulation, so I started using VR 20 years ago, when I used to work on it for things like motor racing and the military," begins Simon Benson, director of Sony Computer Entertainment Europe's Immersive Technology Group. He explains that Project Morpheus doesn't refer to just the headset itself, but the entire environment that Sony are creating for VR, in which the PlayStation 4 will play a critical part. "On the hardware side, we aim for it to be as easy as possible to just put on and work without any setting up – even for people who wear glasses. We also have a social screen on Project Morpheus, which enables anyone in the living room to see what the player's seeing, and maybe even get involved by pressing buttons on their own controller."

The Project Morpheus headset – which, like the Rift, is still very much a prototype – also boasts a 960 x 1080 per eye resolution display, though it's an LCD with a narrower 90-degree field of view than the Rift. Head tracking and PS camera tracking also enables users to move their arms to interact with various games using PlayStation Move controllers. Project Morpheus also features new 3D audio, which re-creates stereoscopic sounds that change in real-time, depending on how you move your head.

"I've had the privilege of presenting this technology to many people both internally and externally, and it's probably been one of the best-received technologies that we've ever put together," continues Benson. "With both traditional videogames and films, what we've been doing is trying to make immersive content fit within the boundaries of a screen, and we've certainly produced some truly amazing results with that over the years. Now, though, you look at virtual reality and suddenly, all the rules change. You no longer have the borders on your screen anymore."

CAMERA MOVEMENTS WOULDN'T WORK IN VR BECAUSE IT'S LIKE GRABBING SOMEONE'S HEAD AND VIOLENTLY POINTING IT IN A DIFFERENT DIRECTION
SIMON BENSON

"You tend to find that in every development studio there's one person who's a VR obsessive, and Sony has got a long legacy of doing head-mounted displays," says Simon Benson, director of Sony Computer Entertainment Europe's Immersive Technology Group

"Virtual reality will probably become something everyone can use within the next five or ten years, maybe less," Luckey explains. "But getting perfect VR is going to need some huge breakthroughs in technology – figuring out how we perceive the world around us and how we can better directly stimulate the brain"

VR could change everything from gaming to online shopping. It might allow users to see what their product looks like in the correct scale, for instance, so that they can see exactly what they're getting before they buy

ADDITIONAL PERIPHERALS

Project Morpheus's compatibility with Sony's Move controllers is only the beginning. Recently, a whole new set of potential input devices, specifically created for virtual reality, have come to the attention of the public.

- **Xsens MVN** Wireless motion-capture solutions that track all your body motions, so that you can move your avatar's body easily in virtual reality. Sixense's STEM motion-tracking system provides another way to do this.

- **Reactive Grip touch feedback** Haptic technologies allow users to feel the impact of a sword, the tug of a fish on the line, or the kickback of a gun – increasing the immersiveness of VR. The first prototype of these controllers was 3D printed.

- **Virtuix Omni** Omnidirectional treadmill that allows HMD users to walk, run, jump or steer through virtual worlds for $500.

The virtual reality revolution

VR DEVELOPMENT DO'S...

- Consistent scale. If I'm walking down the street and there's a car there, I expect it to be car sized. You need to be much more strict on making sure scale is accurate, and not just done for artistic reasons. **SIMON BENSON**
- My solution has been to create a temporary box that is about my height (or some other familiar object) and measure everything relative to that. **DRASH (STEVED)**
- Frame rates. It may have been enough to hit 30 frames per second on a monitor in many cases, but that same 30fps is unbearable in VR. When you're inside a virtual space, 60fps is a good target right now. **DRASH (STEVED)**
- Unity Scripting. It helps to know C#, not only for Unity scripting, but also to dig into the Oculus SDK and figure out how it works. This helped a few times when I wanted to do something more custom. **DRASH (STEVED)**
- Use low-poly assets. There's a lot of focus on low-poly assets out there now for gaming on mobile devices, which is fine for VR, and keeps frame rate high. Still, special care should be taken to ensure that there is detail to look at. I personally just throw a noisy detail texture on just about everything that doesn't have an extremely high-resolution texture. **DRASH (STEVED)**

...& DON'TS

- Don't use camera movements. Camera movements wouldn't work in VR because it's like grabbing someone's head and violently pointing it in a different direction. **SIMON BENSON**
- Depth of field. You can't use depth of field to focus people's attention because in real life, wherever you look you expect things to be in focus. Depth of field is just a jarring effect to the player. **SIMON BENSON**
- Avoid confusing avatars. When you look down you expect that character to be you. Things like changes in skin colour could be quite jarring. You could make the avatars covered – like wearing gloves, or enforce from the beginning that you're somebody else. **SIMON BENSON**
- Don't use UIs. When you think about the real world you don't have a UI floating in front of your face. In real motorsports, for instance, the lap time isn't floating in the sky, it's on boards that racers see as they go around the track, or it comes through the radio. **SIMON BENSON**

Game developers advise others working in VR to nail down any visual artefacts. It might look good on a monitor, but if there is any flickering or a pixel is out of place due to 3D model glitch in VR, it can quickly break immersion

THE SOFTWARE: DEVELOPING FOR VR

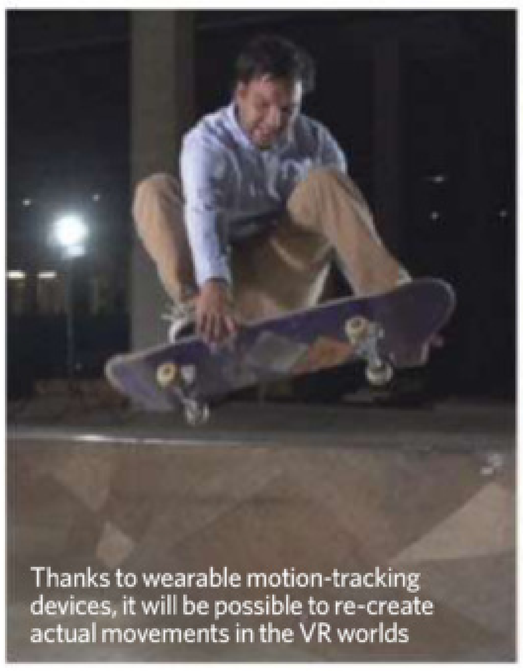
"I have always been interested in game development, but it was never more than just a hobby. It always ended up being so overwhelming to finish a project that I would always lose the motivation halfway through," begins Drash, creator of popular Oculus Rift space experience, *Titans of Space*. The idea came years ago, when Drash had the idea to re-create a modern version of a space documentary he had seen as a child. Then, he saw the Oculus Rift Kickstarter. "The whole idea that the player could step into a world of my own making was all the motivation I needed. I rebooted my space documentary project to compare sizes of our planets, moons, and stars, which then turned into *Titans of Space*."

It is no surprise that, like Drash, many developers across the world were getting just as excited by the prosect of creating worlds their players could truly explore; despite there still being no actual consumer virtual reality device on the market yet.

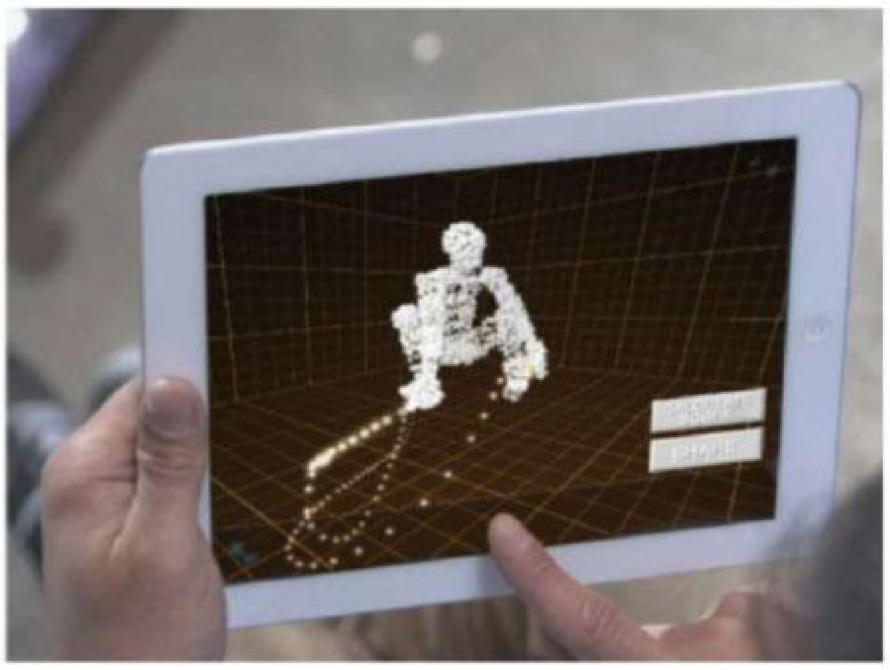
The pipeline to create a game specifically for VR, however, was unlike any other in the field. The photoreal-looking games artists create today are simply too complex to be rendered at the high-frame rate that VR technology demands to deal with issues like latency or motion blur. Also, with users able to explore every inch and corner, a virtual world would need to be very content-heavy, all while having to render everything twice to accommodate each eye.

Graphics are going to keep improving as technology grows more powerful, but until they catch up today's early pioneers of HMDs will have to learn a whole new set of practices as to what will work in VR, treating it as a new medium.

"The Valkyrie project was born from a demo me and a few others at CCP made in our spare time that we called EVE-VR," remembers Andrew Robinson, 3D artist on *EVE: Valkyrie*, a title for the Oculus Rift and the Project Morpheus headsets. Created by CCP Games, the team behind the EVE Online universe, the space combat game is one of the most highly anticipated for virtual reality device yet. "As *EVE-VR* has progressed into *Valkyrie* it's become a bit of an obsession now if, I'm honest," continues Robinson. "It's incredible to take *Valkyrie* to shows like EVE Fanfest and have people bounce off the stage with excitement."



Thanks to wearable motion-tracking devices, it will be possible to re-create actual movements in the VR worlds



Achieving real-time photoreal graphics in VR could also future-proof how studios like Framestore make films, says Woods. It could enable them to render scenes in real-time rather than continue to operate with expensive overheads such as render farms

Like others who spearheaded the development of games for VR, they did not yet have handy documents such as Oculus's 40-page Best Practices guide to work with. Every aspect of successfully developing *EVE: Valkyrie* was achieved through an exhaustive process of trial-and error and experimentation. The only rule? That virtual reality had to have users truly fooled. Otherwise, there was a risk of ruining all the breakthroughs in hardware that had already been achieved.

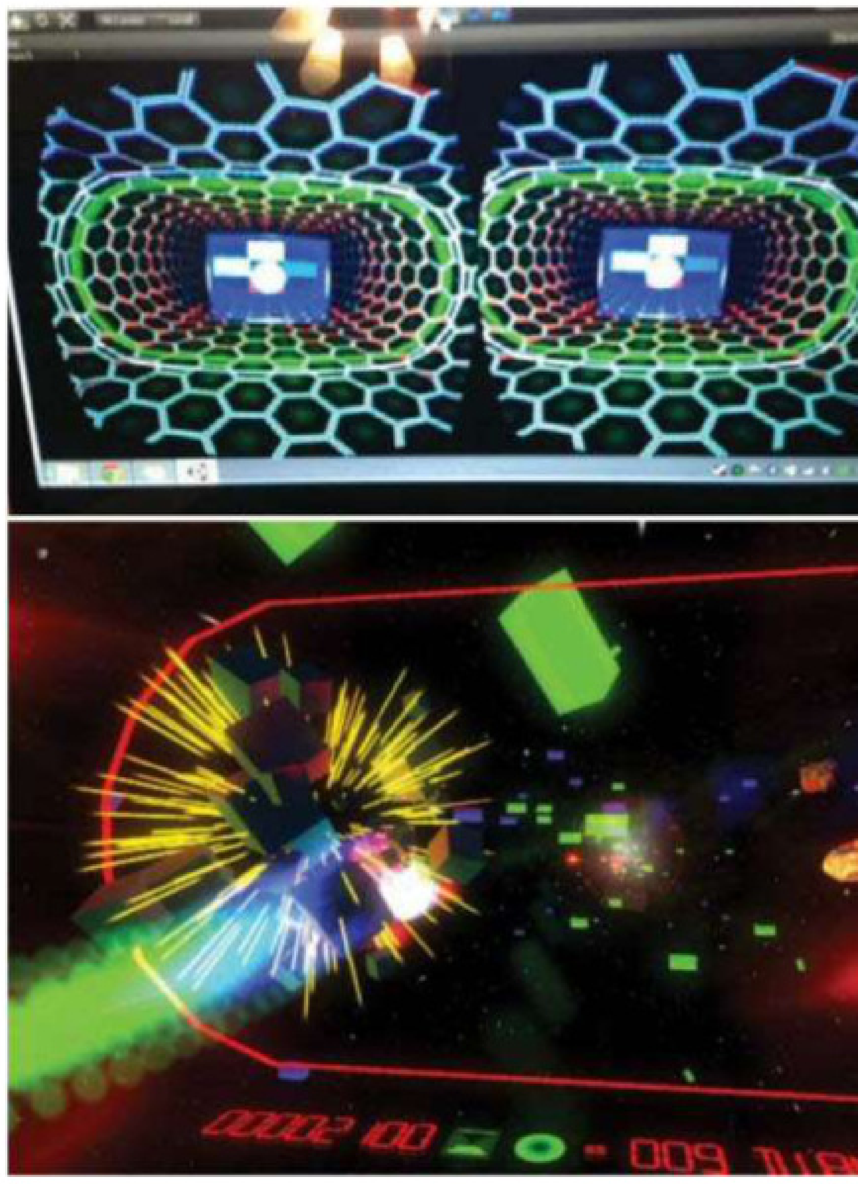
"The biggest risk to VR is a handful of rubbish VR games, which are rushed out," explains Patrick O'Luanaigh, CEO of nDreams, a UK studio that has recently dedicated the majority of its resources to virtual reality development. They too went through an extensive six-month process to decide how to handle to creation of their first VR title, *The Assembly*. "We made a huge list of different things to try and set about seeing what they felt like," remembers O'Luanaigh. "Some things were fantastic, and some were truly vomit-inducing."

Aside from the need to keep everything at a fast-frame rate, one of the biggest challenges, he explains, was to create a great narrative without being able to use any camera movements or cut scenes. They would break the sense of immersion, as such cinematics and predetermined camera movements never happen when looking around an environment in real life. A GUI or heads-up display, often used to show information such as speed or remaining bullets in traditional gaming, would also break immersion. One way to get around these issues was to display such statistics on a watch that the user would need to physically look at, making the whole experience feel much more real.

"The thing is, the challenges of VR are actually big reason why I love the platform so much," adds Justin Moravetz, developer of virtual reality arcade-style game, *Proton Pulse*. To make his game feel even more immersive, Moravetz made a bold choice. He decided to eliminate the need for a keyboard, mouse or controller altogether, developing a game that only needed the headset to play.

> *THE WHOLE IDEA THAT THE PLAYER COULD STEP INTO A WORLD OF MY OWN MAKING WAS ALL THE MOTIVATION I NEEDED*
> DRASH

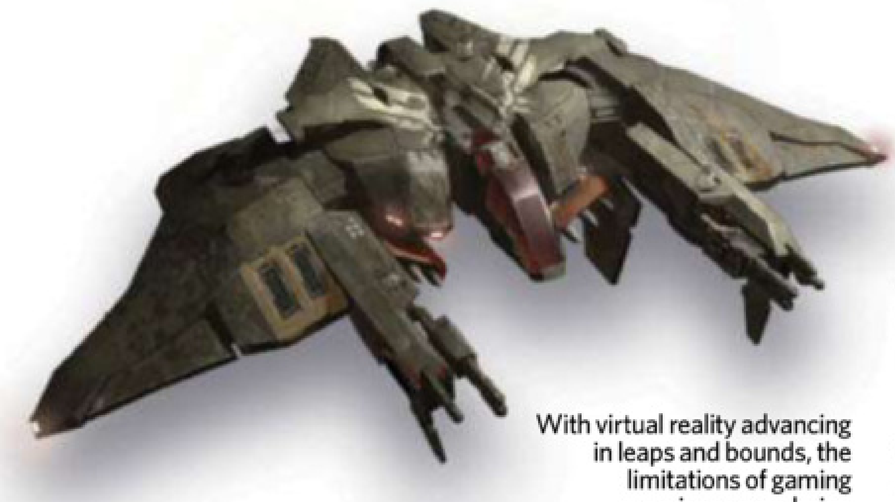
In order to create the game and pursue his dream of VR development, Moravetz left a nearly decade-long career in game development and launched a new startup, ZeroTransform. "Departure from my career was based on a choice," he says. "I couldn't make VR content while still employed. It may have not been the best business decision, but now is the best shot an indie has to do something big for the new platform. I could stay employed and sleep easily for the next few years, or I could take a chance on something amazing."



TOP The first Oculus test of Proton Pulse by Justin Moravetz. "I decided to theme Proton Pulse around the initial spark of interest in VR from the early Nineties. The game is a love letter to the days of Amiga 500s, the promise of VR, and chip tune game music," he explains

BOTTOM Some developers recommend avoiding UIs, which can detract from the reality of the experience. For hyper-realistic shooters, however, it's not so important

The virtual reality revolution



With virtual reality advancing in leaps and bounds, the limitations of gaming experiences are being gradually knocked down

TOP Imagery from Framestore's *Game of Thrones* experience. "Whether you want a career in film, TV or commercials or in VR, we're finding the transfer of skills between those things are all very achievable," says Woods

MIDDLE 3D Artist's own Larissa at INITION's London-based demo studio. "We use the Rift for non-gaming applications," tells Lambert. "It's more about telling a story and getting a concept across, and letting people simply explore."

BOTTOM A *Titans of Space* screenshot. Drash will be releasing an enhanced version of the space documentary experience shortly after the Oculus Rift's Developer Kit 2 arrives

CREATING WORLDS

For many in the industry, gaming is just one of *many* applications for VR. Instead, it could be far more useful for medical applications, or to experience real locations and events from across the world. For Philip Rosedale, it will even present a new kind of social network – a way to interact with others in fully CG universes that you create.

After having fell in love with the idea of a fully explorable virtual world in the early Nineties, Rosedale founded Linden Lab and first launched *Second Life* with it in 2003; a venture that saw everything from Microsoft and IBM setting up virtual offices to host staff training seminars to musicians playing virtual gigs. In 2013, however, it was announced that he was no longer on the board of Linden Lab. Rosedale had started a new project, *High Fidelity*, a next-generation virtual world that would be explorable through the Oculus Rift.

"What we've already done is use hardware technology and cameras to project you into the avatar in a real way, where it's moving the way you move," he reveals. As well as users being able to look around and speak to 3D avatars that realistically represent the facial expressions of the friends you're talking to, the team is also exploring further immersion by allowing users to wear motion-capture suits or use motion controllers for their arms. This would enable the users to be able to reach out and interact with objects and people in the virtual world too.

"We are now alpha testing with a small group of early adopters," reveals Rosedale. He tells us that in the latest version the world can handle full mesh objects and that rich avatars can be imported from avatar creator products such as Mixamo Fuse. The 100 or so early users of *High Fidelity*'s virtual world can even draw new objects in the space, and later modify and delete what they've made using their virtual hands. Or, they can load a file that enables them to simulate shooting a gun at 60 frames per second, so that the other users in the world can see the action exactly as it happens. Of course, the world is also useful for more serious applications – all of the company's meetings are, in fact, held within it. As computers advance, Rosedale concludes, we could even be arguing over the price of virtual real estate in immersive worlds that look just like the forests in *Avatar*'s Pandora.

Framestore, the studio behind the Oscar-winning VFX of *Gravity*, may be on the path to doing just that. The team not only recently completed an Oculus Rift *Game Of Thrones* experience so impressive that it's now on a worldwide tour, but have also announced the opening of their own first VR and Immersive Content Studios, operating across both London and New York.

"We started looking at virtual reality pretty much after the Kickstarter launched for Oculus Rift, when we got a development and started playing around with it," explains senior software developer at Framestore, Michael Cable. The studio began showing the hardware to clients, and got the attention of Relevant and HBO, who commissioned them to re-create an environment from *Game Of Thrones* – the colossal 700-foot Wall – and have people using the Oculus Rift feel what it would be like to scale it. Using their award-winning pipeline, Framestore's incredible artists needed to translate what they'd learned in visual effects to virtual reality. "We were already beginning to use game engines for other interactive projects," Cable continues, "so it was pretty simple to get into it because we're using tools like Maya and MARI to do our textures and modelling for our commercials or films, and the same sort of tools are then used for game engines as well."

Even with these advantages, the team still ran into the same challenges that all other pioneers of immersive VR had in the past, enhanced by the fact that they wanted the experience's graphics to be representative of the photorealistic work Framestore would usually produce. To increase immersion as much as possible, real elevators, wind machines, and rumble packs were used, along with some extremely powerful hardware. "We got the latest graphics card that NVIDIA currently make and had a pretty powerful i7, so it was pretty much a very high-end gaming rig that we ended up building for each one of these experiences," says Cable. "We were pushing them all to five per cent of the margin, so we were right up against it!"

"We were forever looking for more GPU," laughs global head of digital, Mike Wood, "and we could do a whole other interview about motion sickness and what we've learned about it!" Still, it's impressive to note that every single artist that created the experience had come straight from working on Framestore's feature films and TV commercials. Not one of them was brought in specifically from a gaming background to make VR content. Despite this, Framestore create a virtual environment so impressive that its newly opened VR studio is already working on several other projects.

It seems readily apparent that, in the coming years, applying to work in games or VFX studios such as Framestore will mean more than just creating amazing graphics, feature films, or the latest TV commercial. It could mean you'll be developing entire photoreal virtual worlds for people to lose themselves in. There's a big change coming in the way we experience not just entertainment, but society. We can't wait to see what's next.

VIRTUAL TELETRANSPORTATION

London-based interactive production studio INITION specialises in creating new projects with emerging technologies. It's been exploring virtual reality since 2001, and has a Demo Studio to showcase the installation work that it has created so far.

One of their latest projects involved using the Oculus Rift to virtually teletransport five competition winners, taking them from Topshop's flagship store to a real catwalk broadcast during London Fashion Week.

Before the Rift came out, the team used a pair of ski goggles, small LCD screens, and a 3D printer and scanner to develop their own HMD prototype for use in a Nissan campaign. "We created a wingsuit simulator basically," says Alex Lambert, senior creative at the studio. "You fall out of a plane, you collect car parts on the way down, and then you have to land on the roof of the car at the end. It's on a motion platform, with articulated wings that let you steer." He then points out one of the pharmaceutical virtual reality projects that the INITION team has worked on. "It's a glycemic event simulator, so say if I have diabetes and I don't have enough sugar or I have too much sugar, I could have a hyperglycemic event while driving. One of the symptoms is loss of strength, so we made it harder to turn the steering wheel, and we did things like reverse the head tracking to add a level of confusion."

IT'S INCREDIBLE TO TAKE VALKYRIE TO SHOWS LIKE EVE FANFEST AND HAVE PEOPLE BOUNCE OFF THE STAGE WITH EXCITEMENT

ANDREW ROBINSON

"Because we were so early out of the gates there was no established best practices to refer to," says Andrew Robinson. "As such, both the *EVE-VR* and *Valkyrie* projects have been developed through rapid prototyping in engine. We build it, then test it with the headset on and get a feel for it. If it does not work we put it to one side and try something new"

I made this...

Incredible 3D artists take us behind their artwork

Baolong Zhang

Website www.baolongzhang.blogspot.co.uk

Country UK

Software ZBrush, Maya, Photoshop

Bio Baolong is a lead character artist at Supermassive Games

The Execution of Lady Jane Grey, the Tribute

2014

In autumn last year, I went to London with some friends to visit the National Gallery. When I passed this painting by Paul Delaroche, I really felt the emotional impact as it's such a powerful image. It was then that I decided I was going to re-create it with digital tools.

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Jared Krichevsky

3DArtistonline

Username: Monstermash042

Personal portfolio site
Jaredkrichevsky.blogspot.com

Location Hollywood, CA

Software used
ZBrush, KeyShot 4, Photoshop

Expertise Jared specialises in 3D modelling and sculpting for conceptual illustration

Use masks in ZBrush

Warrior God of Light 2014

> Learn how to create a celestial warrior, from concept all the way through to the final render

Jared Krichevsky is a character and creature concept artist working in the motion-picture industry

In this tutorial, I'll discuss the creation of my warrior god of light concept. We will start from a rough idea using early thumbnails and sketches. We will then move on to modelling, primarily covering the use of Alphas and masking to cut out details in meshes, using powerful features such as ZBrush's ZRemesher, GroupsLoops and Panel Loops. This tutorial will also cover how to manage large characters to create dynamic poses and how to prepare your model for high-quality rendering inside of KeyShot 4. In addition, we will also look at how to manage our files to better deal with things like crashes and data loss (hint: this involves saving quite a lot).

Concept

The Justice of Light is a four-armed suit of armour. As a sentinel of peace, its mission is to protect the boundaries of the realms of Light, Honour, Balance and Justice.

With the Disc

Tutorial files:
- Project Alphas
- Timelapse videos
- Base mesh for starting
- Various works in progress
- The completed model

Learn how to

- ☑ Cut out armoured shells from a base mesh
- ☑ Create highly detailed pieces
- ☑ Use GroupsLoops for cleanup
- ☑ Use the ZRemesher
- ☑ Extrude pieces using Panel Loops
- ☑ Add details with Frame Mesh and IMM
- ☑ Pose a highly complex character
- ☑ Decimate for render
- ☑ Render inside of KeyShot 4

01 02

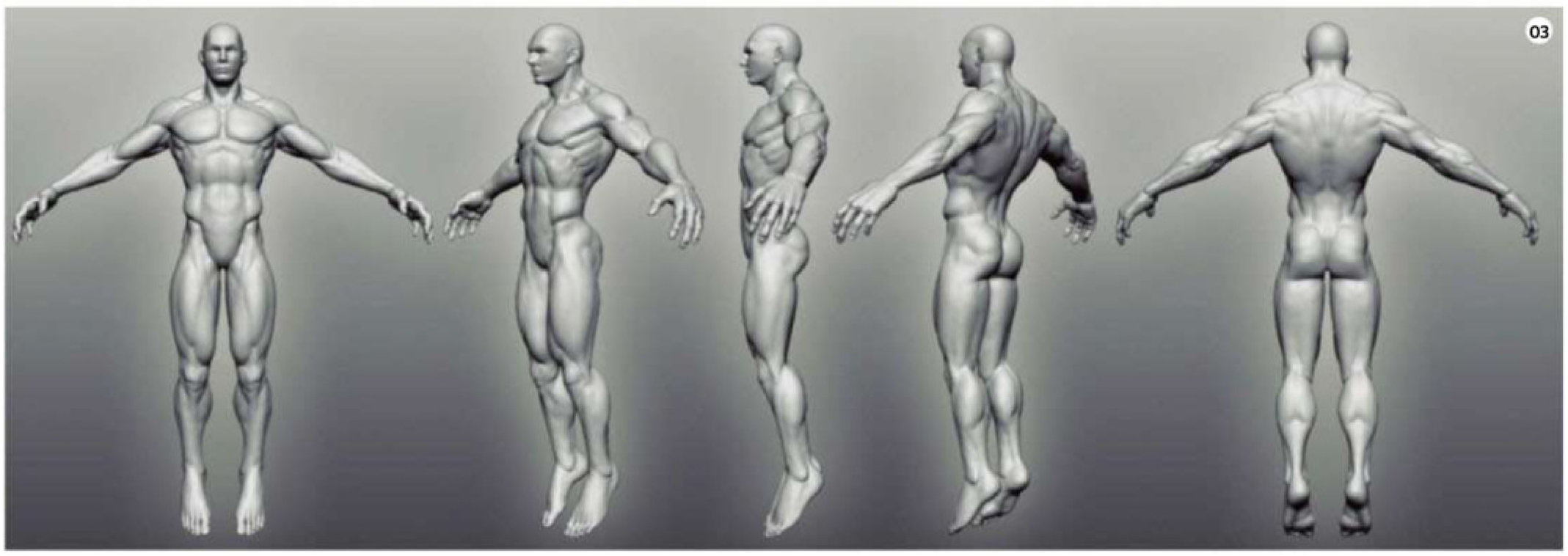
01 Pick a side When building a character from nothing, it can seem daunting. The possibilities often feel endless, so which genre do you pick? Is your character good or evil? Where do they come from? I find that asking these questions is a good way to start. I decided that I wanted to create a warrior of light; a holy suit of armour that could deal out justice and eternal punishment against an ancient enemy. That was story enough to get the creative juices flowing.

02 Get it on paper Even a thumbnail sketch can be enough to help build a story around your character. Start small and rough using a ballpoint pen and heavy markers. There's no need for perfection here, just stay fast and loose, with your wrist reasonably relaxed. As you do more iterations you can start to define character attributes a little better, adding bits of detail. Don't commit to any one feature just yet, but instead let the character evolve naturally. It was during this stage that I developed my idea of being able to see through the character, and that he would be flying through the air.

03 Jump into ZBrush Pending approval of the concept, jump into 3D with ZBrush. For my base mesh I used the Nickz_humanMaleAverage.ZTL that comes standard with ZBrush. It's a fantastic starting mesh that gives you good starting proportions and excellent topology for sculpting. Using a library of anatomy reference, sculpt out the physique of the warrior. We want to create the sense of perfection, strength, and power in the anatomy. This will become the base for creating his armoured shells. Though we could spend forever defining the anatomy, remember it will be sliced up.

Sculpting human anatomy

When sculpting human anatomy, it's important to have as much reference as possible. Using a second monitor, scroll through dozens of images as you work on that part. Even with sculpting experience, it's always important to reference real life as much as possible. Sculpting anatomy with confidence takes time and experience – each time you sculpt another character, commit yourself to memorising the formal names and shapes of particular parts, bones, muscles groups, and so on. As you become more familiar with human anatomy, the sculpting experience becomes more fun and less daunting – you may even find it relaxing.



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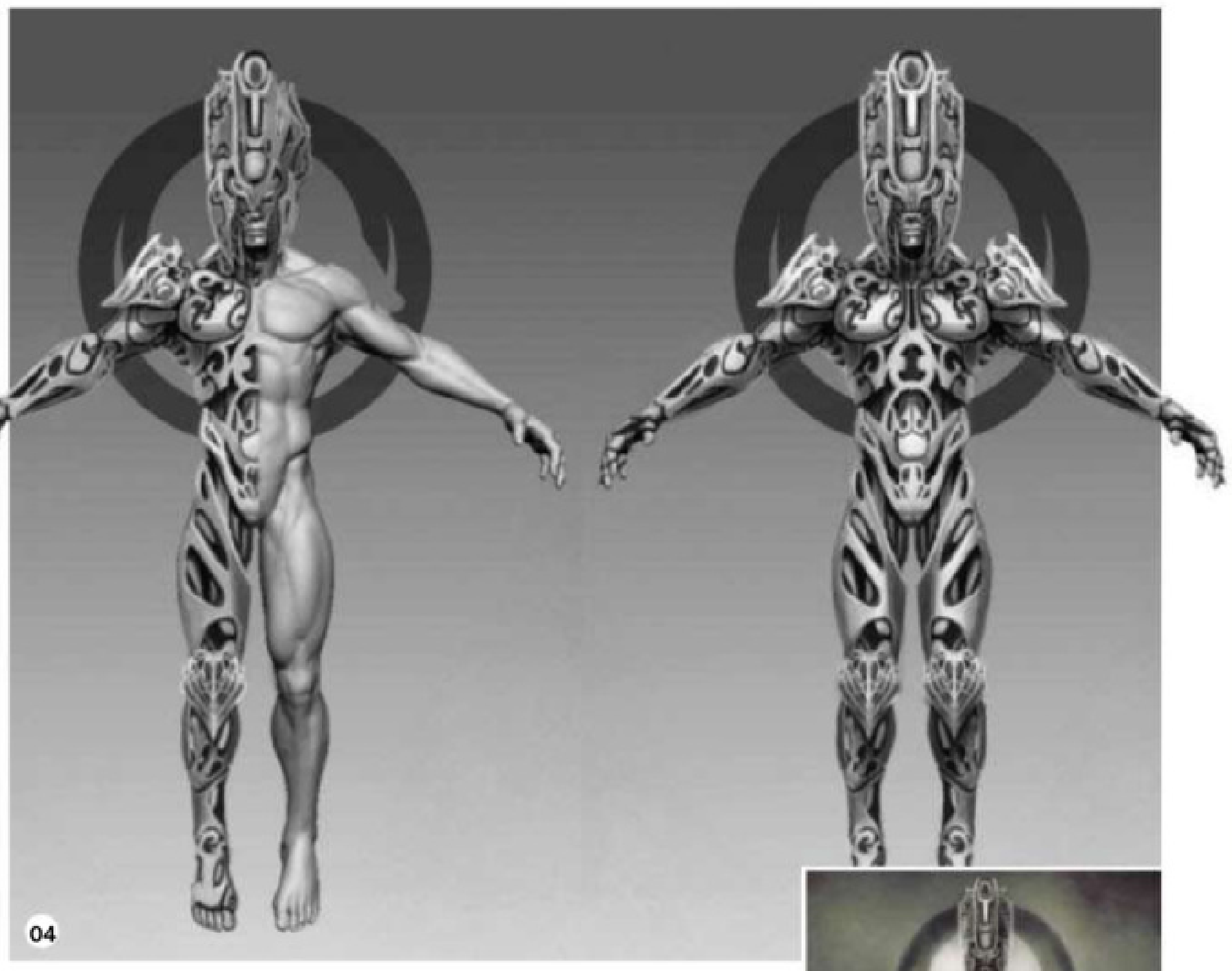
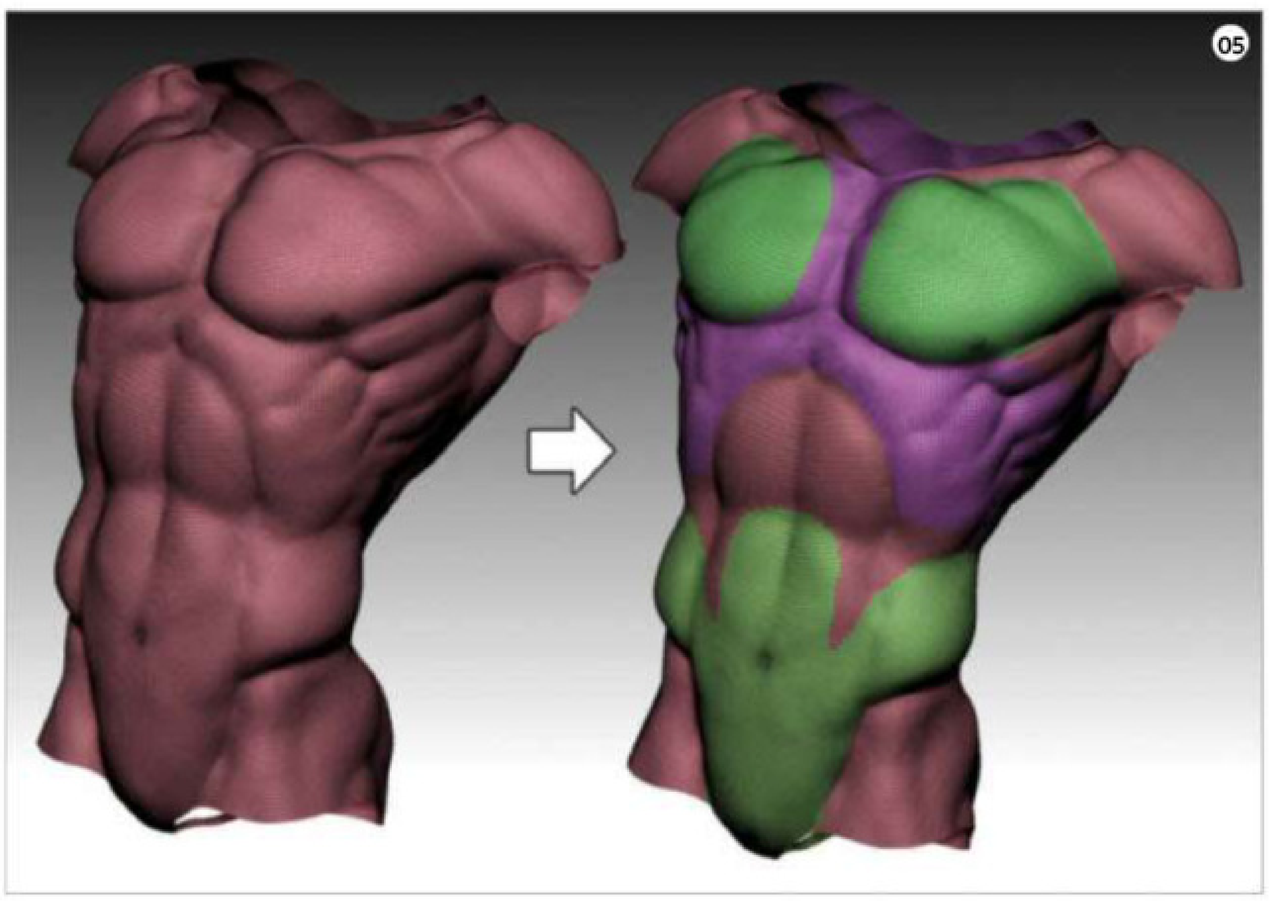


04

04 Additional concepting After completing the base anatomy, we need a better blueprint to flesh out the details. Grab a front-view snapshot of the character in ZBrush and bring that into Photoshop as a base to paint on. Painting on one half of the model enables us to flip it to the other side in order to speed up the concepting process and solve and problem areas. Once you've reached a good point with the image, repose the character quickly and give it the second set of arms, adding textures and a touch of lighting to give the image that little bit more interest.



05

05 Block out large sections Using our sculpted base mesh, we can begin to shape out the major sections of the armour. Using the Mask Pen function as the main masking tool, mask out the armour and press Ctrl+W to PolyGroup that area. Split up the larger areas, such as the head and torso, into new SubTools for easier management. Next, split apart the areas that can be easily mirrored, such as the arms, shoulders, hands and legs. Once the major areas are taken care of, take those parts and split them into smaller sub-sections again using the same masking and grouping technique.

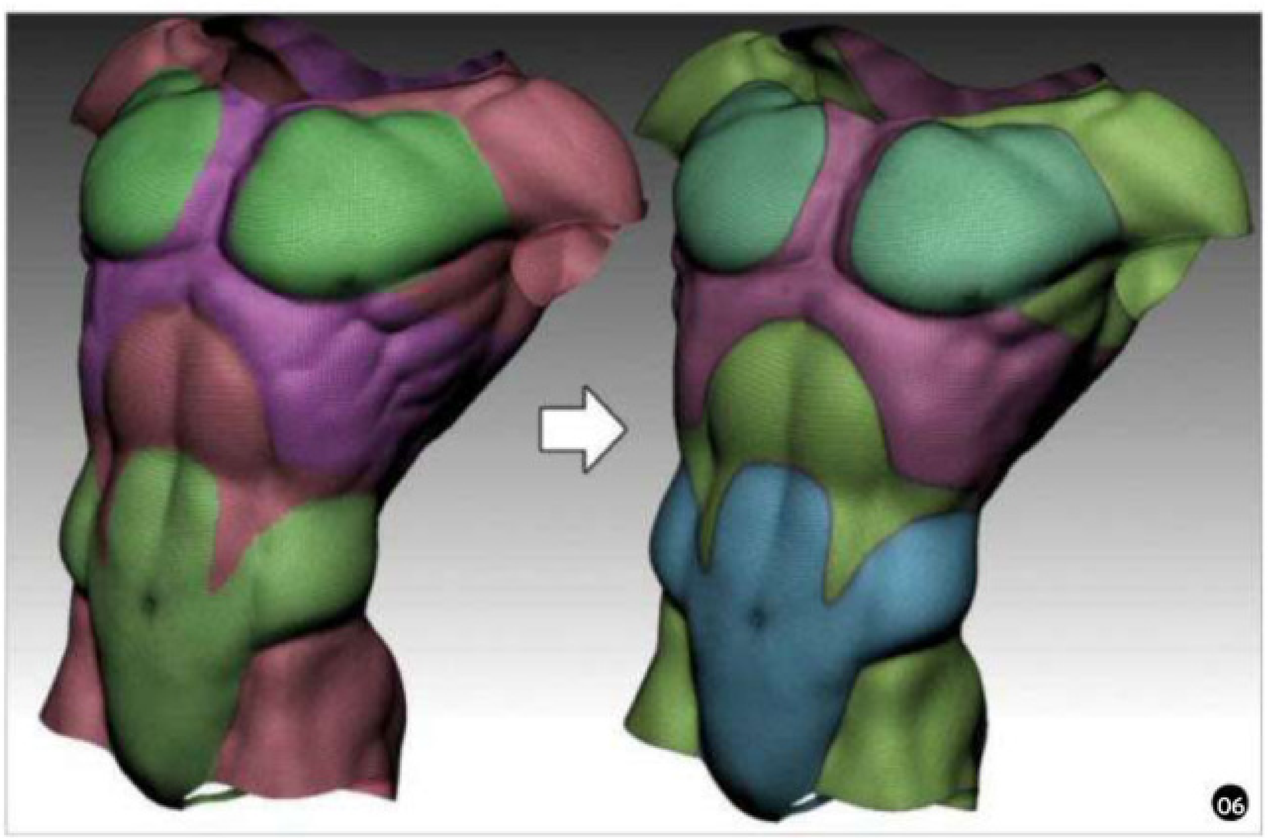
Artist Showcase

Jared Krichevsky

In 2010 I completed the CG certificate program at Gnomon School of Visual Effects. I currently work at The Aaron Sims Company, where I now work as a creature and character designer. In addition to this, I teach Creature Modelling and Sculpting at Gnomon School of VFX.

Hot Top **ZBrush, KeyShot, Photoshop (2013)**
I wanted to create a race of Lightning Bug warriors with glowing heads. It was a great way to test out the new lighting features inside of KeyShot.

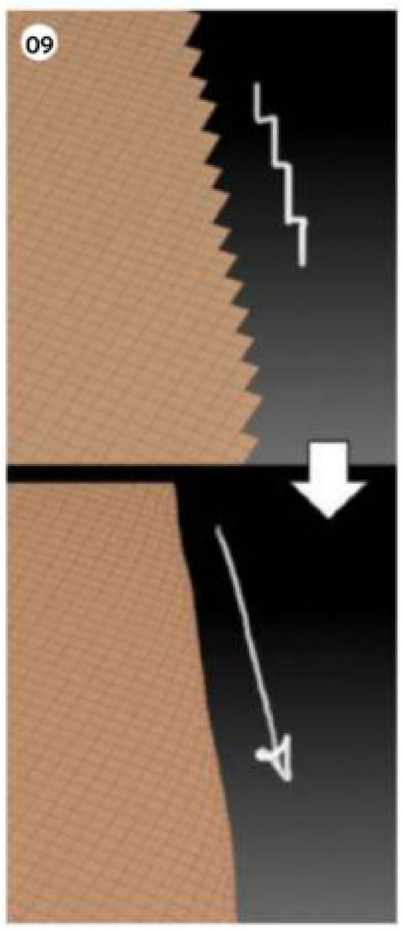
Out for a Stroll **ZBrush, Photoshop (2012)**
When I used to take long car rides as a kid, I always imagined giant mountain monsters getting up and walking around.



06 Clean up with GroupsLoops To get clean cuts between these sections, use the GroupsLoops feature found in the Tools>Geometry>Edge Loops>GroupsLoops menu. This creates an edge loop around grouped pieces. Depending on how you want the shape to hold, you may have to subdivide your mesh a couple of times. Set your number of Loops to about 2 and keep the Polish settings very low, from 0 to 1. Too much Polish can soften the shape of your shell, which you may or may not want. From there run the ZRemesher to give it good topology.

08 Cut out complex pieces It's important to note that you'll have to subdivide your model and delete lower SubD levels to hold the detail. Stay under 500,000 polys, as anything higher will crash. Once you have your pattern, use the Mask Pen tool and the Sharpen Mask feature to clean up areas where the Alphas may have overlapped. Next, use Ctrl+W to PolyGroup your mesh. Delete the part of the mesh that you don't want by going to Tools>Geometry>Modify Topology>Delete Hidden. You'll be left with the detailed cut of armour.

09 Keep cleaning up After cutting out the fine details, when you zoom in you may notice there is stair stepping, which prevents the shell from looking clean. To counteract this, use the GroupsLoops tool with a low Polish value. GroupsLoops will average the distance between the vertices by welding them together and creating a border around the mesh. Be wary of any floating pieces or tight corners where the vertices may have overlapped in the Polish function. You may have to use the Move Topology brush with a low Draw size to manually move those vertices into place.

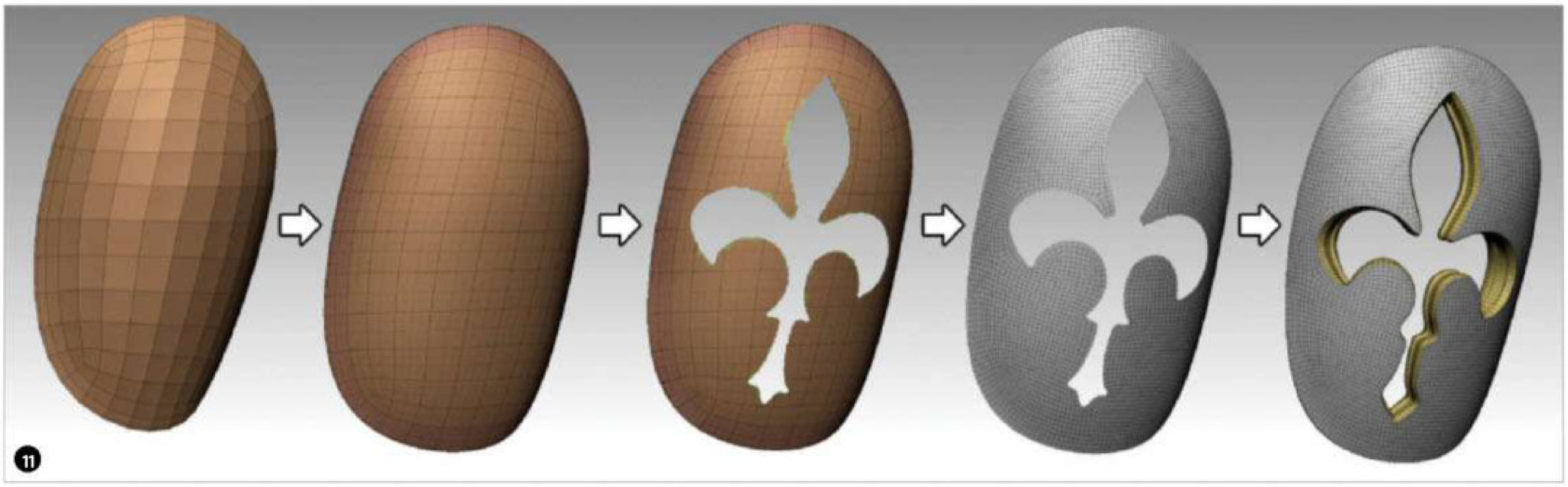


10 ZRemesh the shells Use the powerful ZRemesher feature found in Tools>Geometry>Edge Loops>ZRemesher. With the click of a button you can remesh your shell into something workable. To hold the shape of your mesh even further you can use the Frame Mesh option found under the Stroke>Curve Functions>Frame Mesh. Using Frame Mesh with ZRemesher will help hold your shape even better. After remeshing, use another GroupsLoops for border edges. How much Polish you use will determine the shrinkage of your mesh, so sometimes using a value of 0 leads to the best result.

07 Use custom Alphas One reason to use GroupsLoops after having used the ZRemesher is because the GroupsLoops will not only add Edge Loops to the mesh, it will create PolyGroups along with those Edge Loops. Use those PolyGroups to mask the edges of the mesh. With the edges masked, use custom Alphas made in Photoshop, then import them into the Alpha menu in ZBrush. Change the masking to Drag Rectangle with Drag Draw selected as the Stroke type and make sure that you have your Alpha loaded into your mask. Next, proceed to mask using your Alphas to design the armour by holding Cmd/Ctrl and dragging out the stencil. This will be important over the next few steps.

Create custom menus

When using similar features repeatedly – in this case, GroupsLoops, ZRemesher and Panel Loops – you don't want to have to dig through the same menus each time. It may be wise to build yourself a custom menu. By going to the Config menu and hitting Enable Customize, you can then go to the Custom UI tab and hit Create New Menu, and then proceed to name it. By Holding Cmd/Ctrl+Shift you can drag on any icon into your new custom menu. Be sure to hit Config>Store Configuration as well as Save UI so that you have it on file.



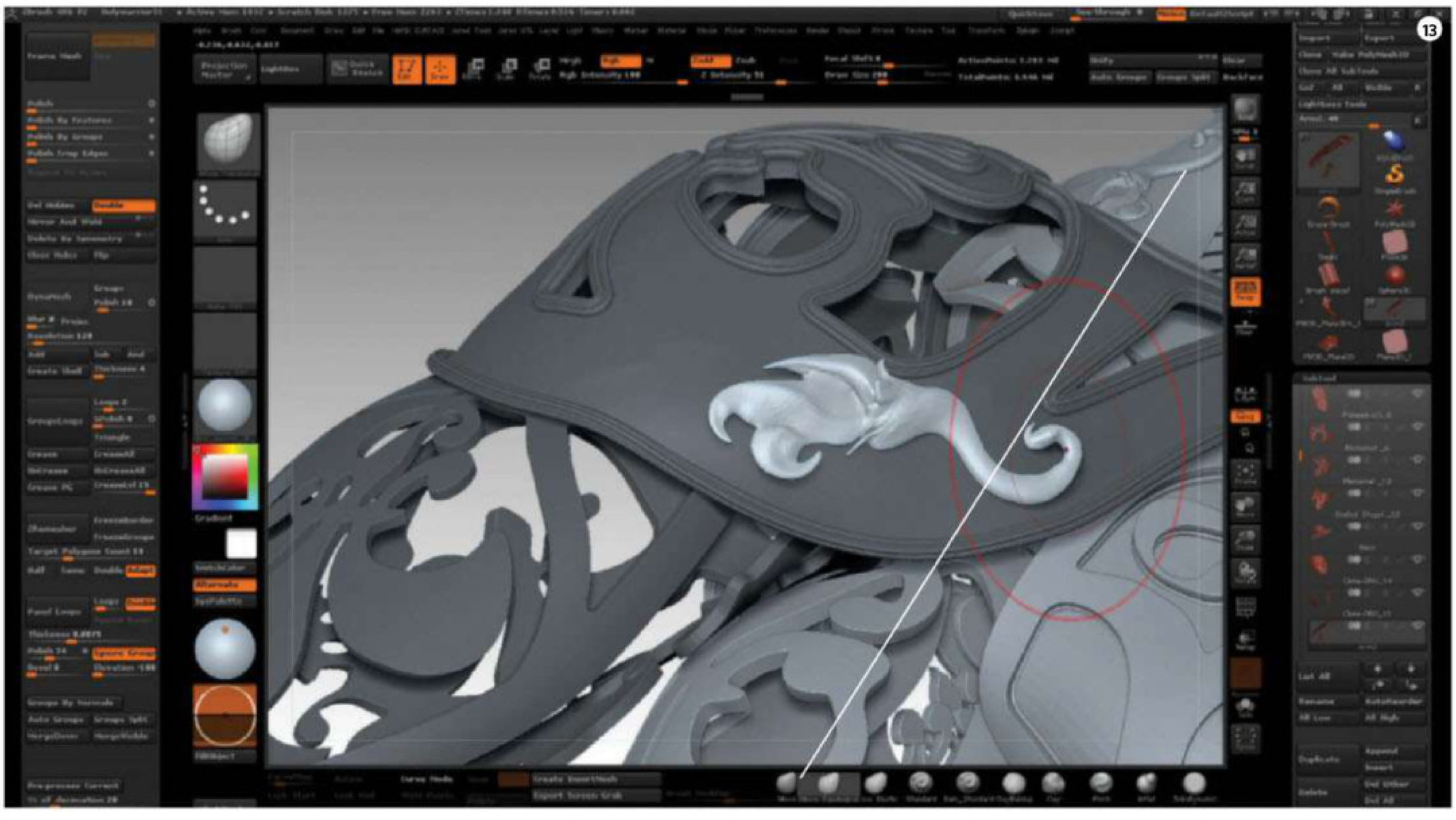
11 Add in Panel Loops for thickness To finalise the armoured shelling process, we need to add thickness using the Panel Loops feature found in Tools>Geometry>Edge Loop> Panel Loops. To hold its shape we don't want to use any Bevel or Polish, so keep those settings at 0. To make sure that the piece extrudes in, set the elevation at 100. Keep the Thickness settings low as too much will cause the mesh to overlap in tight corners. Inspect the mesh to check for any overlapping areas and clone pieces at various stages to ensure that if you make any mistakes, you can always go back.

Insert the trim

To create the trim along the borders, first create a custom piece of geometry that will travel the length of the border and make it an Insert Mesh brush, then go to Tool> PolyGroups>Groups By Normals. This PolyGroups is based on the direction of the Normals. Next, isolate the outer-part of the shell and hit the Frame Mesh button. Tapping on the curves that appear on the border with your Insert Mesh brush will frame the entire shell with your brush. By adjusting the Depth slider found in Brush>Depth, you can adjust how deep into the surface the trim will go.

12 Save your work Make sure you version up often and save as often as you can. In the Config>Quicksave menu set the Maximum Duration so it saves every 20 to 30 minutes. Set the Rest Duration to 5 minutes in case you step away from your desk. To avoid your files getting too large, check on Skip History. In the Config>Undo History tab turn off Enable Saving, and turn on Skip Loading. Saving your history with projects can be a good thing, but on large projects the files can get too heavy to save or load. After that, hit Store Config.

13 Adding Details with IMM The Insert Mesh brush is a great way to add details to your model. Also, using the ShadowBox feature with your custom Alphas can quickly generate meshes to be sculpted on. After refining the shape that you want – in this case a decorative floral attachment – you can use the ZRemesher function to clean up the geometry. When finished with your piece, press B to call up the Brush menu and press the Create Insert Mesh button at the bottom of the menu. Now draw on these new details and conform it to the surface of your armour.

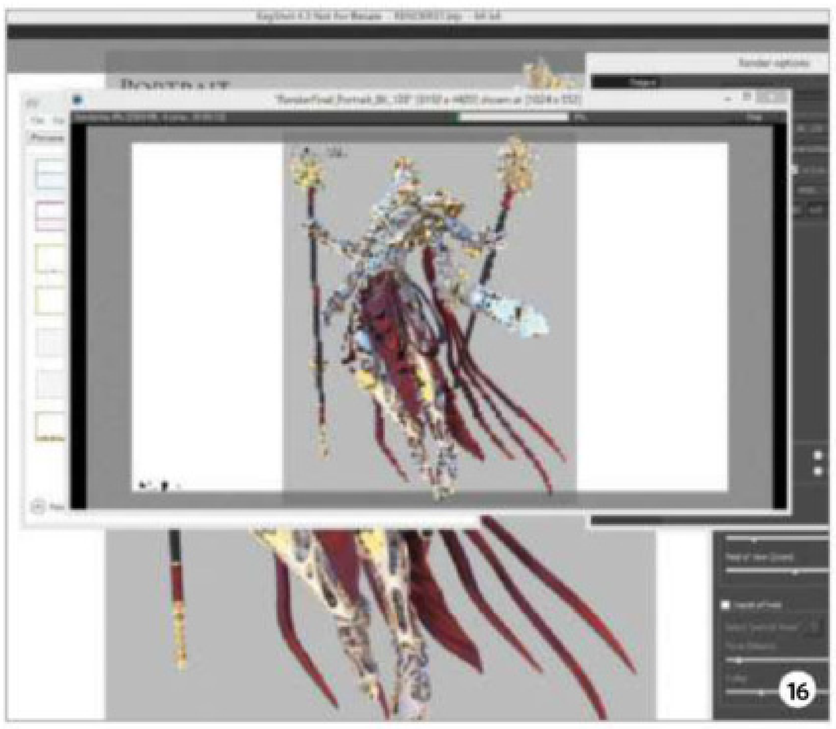


14 Decimation Each time you add thickness, you're doubling the polycount of your armour, which can really increase your overall polycount. To keep that low, add creases by hitting Groups By Normals, then going to Tools>Geometry>Crease>Crease by PG, setting the CreaseLvl to 3. Next, subdivide the mesh to a couple of million polys. Under ZPlugins>Decimation Master, PreProcess and then Decimate the mesh. You can PreProcess and Decimate the mesh several times, each time with a higher percentage of Decimation. This will triangulate the mesh and dramatically lower the polycount, but make sure you stop when you lose too much detail.

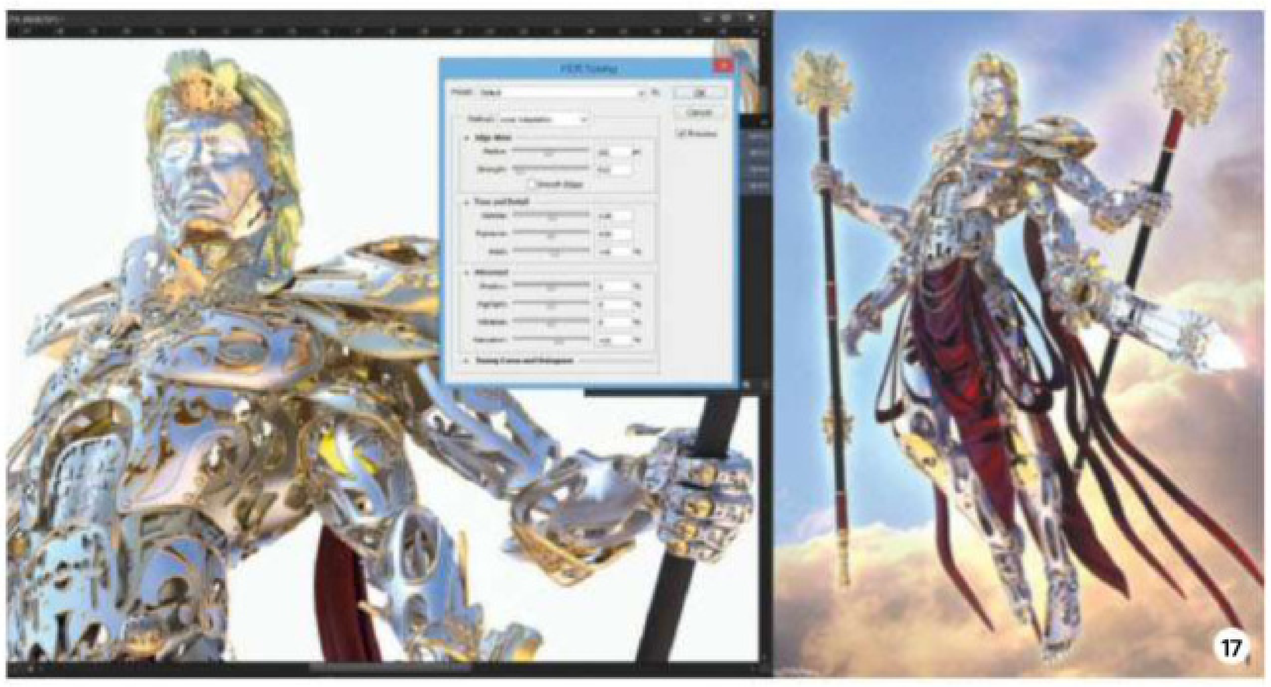
15 Pose your character Decimation and preparing for pose is the most time-consuming part of the process, but once you have things like the head, torso, arms, legs, hands and fingers grouped properly, posing will feel more natural. Block out your pose very quickly and then move on to the specifics of the pose later. The most effective method is dragging the Transpose tool from end to end and rotating in the centre circle. Don't be afraid to use the Move tool to grab multiple pieces at once and work them to get a more dynamic shape.

Light in post-production

Rendering out a Normal pass can be extremely useful to relight your character in your post composite. First, set your Normal pass as a Color Dodge layer, go to the adjustments and grab a Channel Mixer adjustment. Clip it to the Normal pass and when you open the Channel Mixer properties, click the Monochrome check box. Now, dial up and down the Red, Blue, and Green sliders to effectively relight your character. Use the Opacity and Fill sliders to make the effect more subtle. Changing your Normal pass layer to a Multiply can also help you readjust the shadows.



16 Render inside of KeyShot Many artists enjoy using KeyShot for its ease of use, extensive material library and excellent real-time rendering. Once posed, split up objects and group them by similar material properties such as silver, gold, gold trim and cloth. After this import the OBJs into KeyShot and set up a HDR to light the warrior. In my project, I did some render tests and decided that the only way I could hold the amount of resolution needed was to set up an 8K render at 128 Samples. Even though this makes for a long wait, it will ultimately be worth it.



17 Finish the image While setting up the render, set it up as an EXR with Transparency and make sure to render out a Depth, Normal, and Clown pass. Bring the images into Photoshop and stack them into a document. Adjust the final render by going to Image>Adjustments>HDR toning. In this case, the setting Local Adaptation was sufficient. The best method for editing your final image is to keep it organised by labelling your layers and keeping things grouped together. Now you can add the finishing touches like glow, depth and levels.

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2013 Scientific and Engineering Award To Ofer Alon for the design and implementation of the ZBrush software tool for multi-resolution sculpting of digital models. ZBrush pioneered multi-resolution digital sculpting, transforming how artists conceive and realize their final designs. ZBrush has enabled artists to create models far more quickly and with much greater detail than previous approaches.

> The most important thing for any 3D character artist is the modelling and sculpting process. Spending time on forms, shapes and anatomy is key. If this is done well, the finished character should look alive

Capuchin Thug 2014

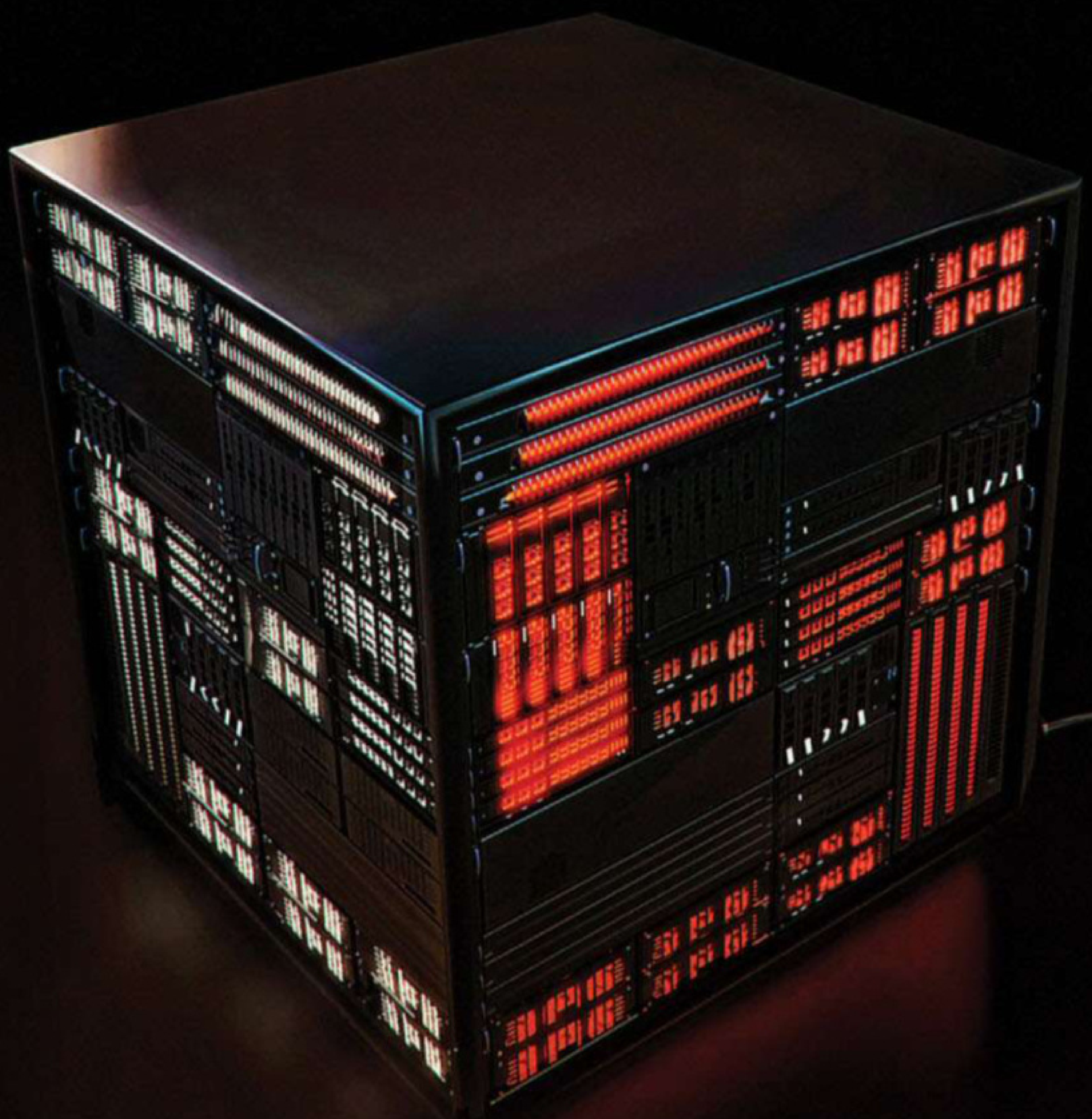
For this piece I was motivated by the fantastic concept artwork of James Kei. It's simple, but it displays strong personality and character. The project was a nice challenge for me, as I used different software and workflows for the first time. Arnold is a really great render engine and Yeti was very simple to use to create the hairs and fur on the characters. In the end, the process was easier than I anticipated, so now I feel far more comfortable with my new workflow and software.

I made this...

Incredible 3D artists take us behind their artwork

Seid Tursic

Website www.behance.net/seid
Country Bosnia and Herzegovina
Software ZBrush, MARI, Maya, Arnold, Yeti
Bio A self-taught 3D character artist with experience in game cinematics and animated features



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Alchemy | Blender | Cycles | Photoshop

Step by step

Easy-to-follow guides take you from concept to the final render

Gleb Alexandrov

Personal portfolio site www.blender-game.com
Country Belarus
Software used Alchemy, Blender, Cycles, Photoshop
Expertise Gleb takes a generalist approach to 3D and is well-versed in Blender

Create a robot in Blender

00_Robots 2014

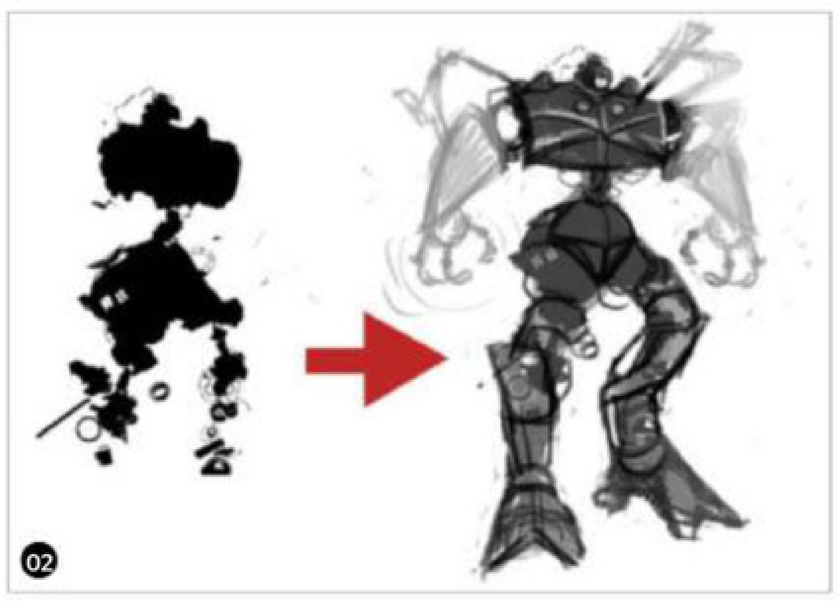
> In this tutorial we'll take a look at the techniques you can use to create unique, interesting robots with Blender's open source tools

Gleb Alexandrov is a CG artist, indie game developer and Blender enthusiast

In this tutorial we're going to discuss how to create complex robotic machinery in Blender. To gain an overall understanding of how you can approach the complex robots, we will break the subject into sections, including concept art painting, modelling, texturing, rendering and post-processing. As you will see, preproduction is a particularly important stage; it's always much advised to lay out the basics of the image before moving on to actual production. This is because, as you will likely know from experience, there is nothing more intimidating than a blank page. Conceptual elements like finding a unique silhouette for your robot and developing it into a sketch can actually be one of the hardest parts of the process. A good way to approach this problem is to spill your ink, so to speak, to create some interesting shapes. To do this, we'll be using a free tool called Alchemy.

When it comes to materials and textures, we'll be making use of varied techniques such as procedural and hand-drawn textures. Hopefully you'll pick up some useful skills that will help you with your own work in the coming years.

01 Generate the initial shape To get started on the sketching process, use the free sketching program Alchemy and generate some random silhouettes. This program provides a large set of tools for the random generation of shapes, but we're just going to use the Pull Shapes tool. This picks a figure from the library, randomises its parameters and draws it onto the canvas. Select Pull Shapes, set style to Fill, include only the Parts folder and start working on a silhouette. When you spot something interesting, save the result.



02 Interpret the shape The next step is to take the shapes that we've generated, pick the most evocative ones and start interpreting them. Discovering robots in the random inkblots can be an exciting process, but also very time-consuming. Rotate the canvas to refresh your vision and split the figures into parts if you can't find a robot shape that you like. Don't worry – eventually an image will pop into view. After you decide upon the final silhouette, start sketching.

Evaluate the concept early on

If, for some reason, concept art doesn't work for you, it's okay to take a step back and amend the design. Later on down the road it may be much harder to do, especially when you're deep into the modelling process. So if concept art doesn't convey the message clearly, or doesn't capture the feel that you're going for, consider going back and trying one more time.

03 Paint the sketch Open your preferred image editor and start painting over the silhouette to clarify the overall shape of the robot for modelling. During this stage we're also going to come up with the design and the style of the robot. Will it be cartoonish or have a realistic edge to it? What pictures, films and games influence our decisions? Do we want it to be like a Jaeger from *Pacific Rim*, or Wheatley from *Portal 2*? Our rough concept should be sufficient enough to answer these questions once we've finished it.

With the Disc

Tutorial files:

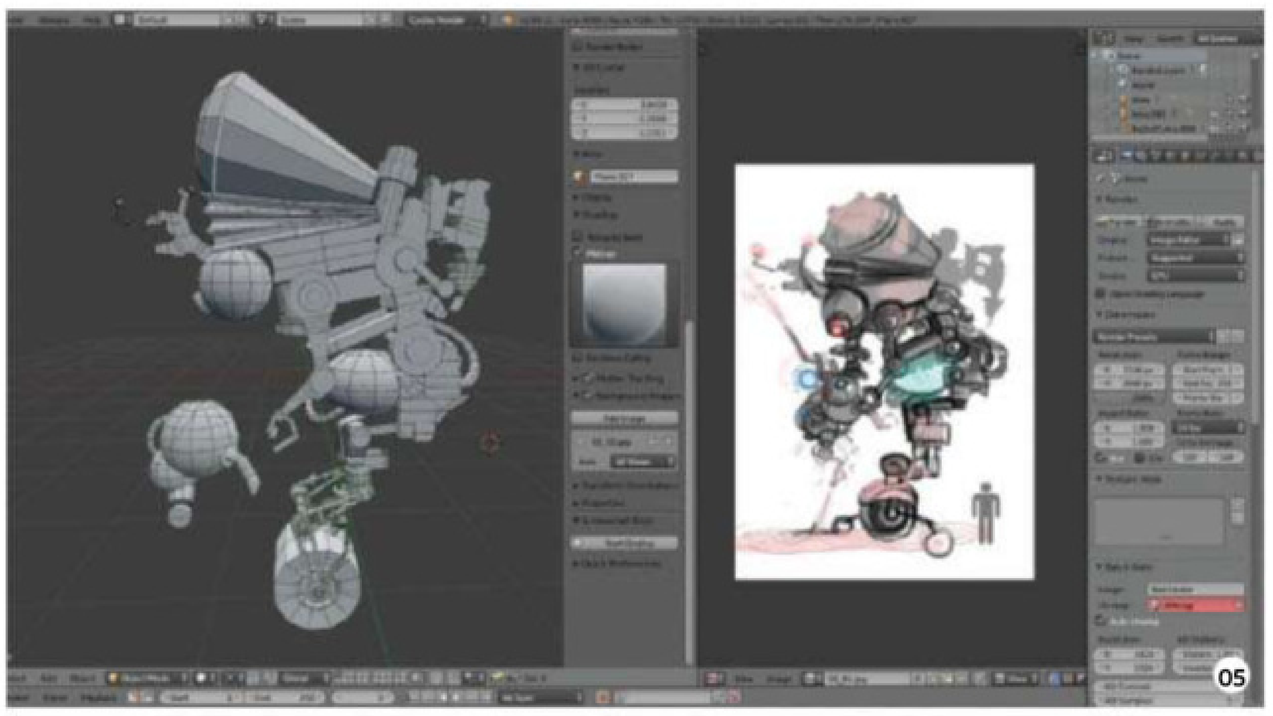
- Time-lapse video
- Tutorial screenshots

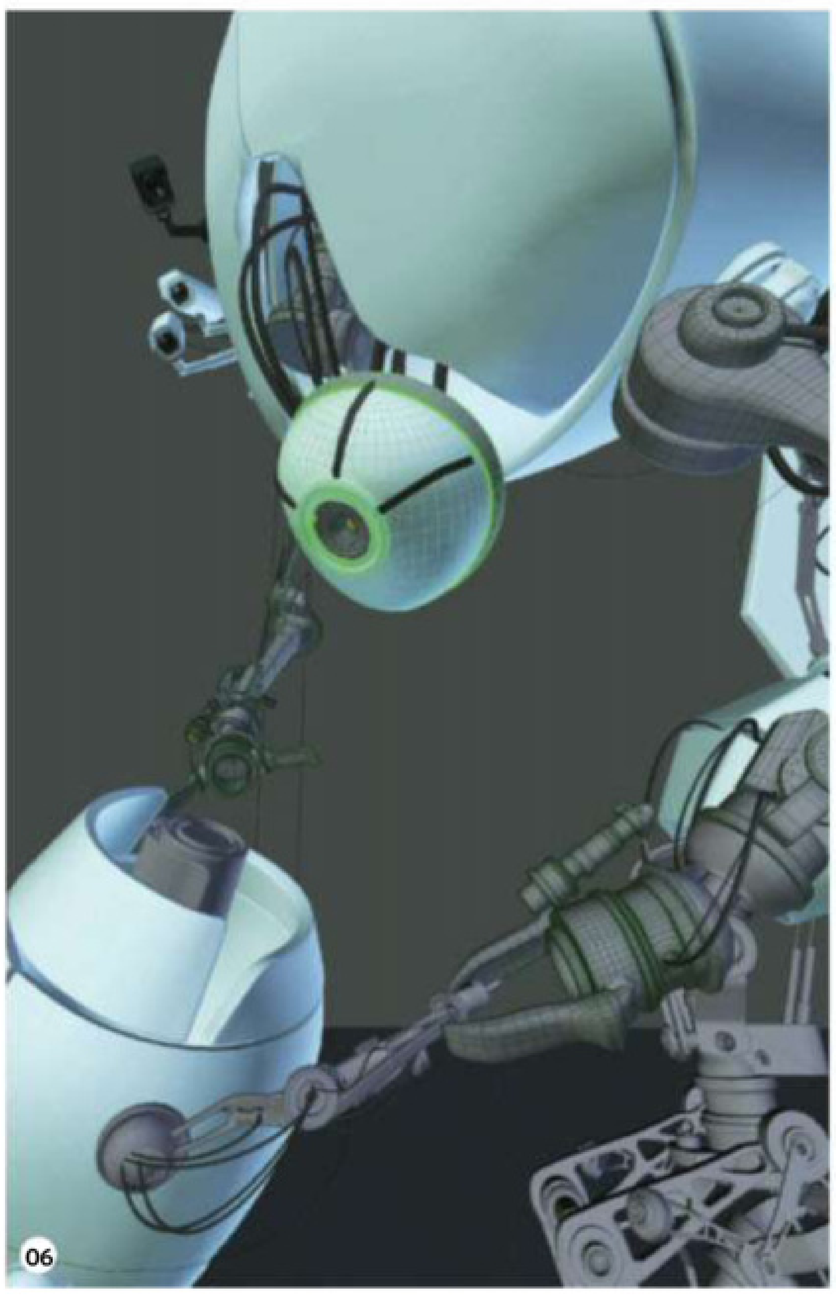
Learn how to

- Sketch the design of the robot
- Create hand-painted and procedural textures
- Bake Vertex Colors into textures
- Set up the render

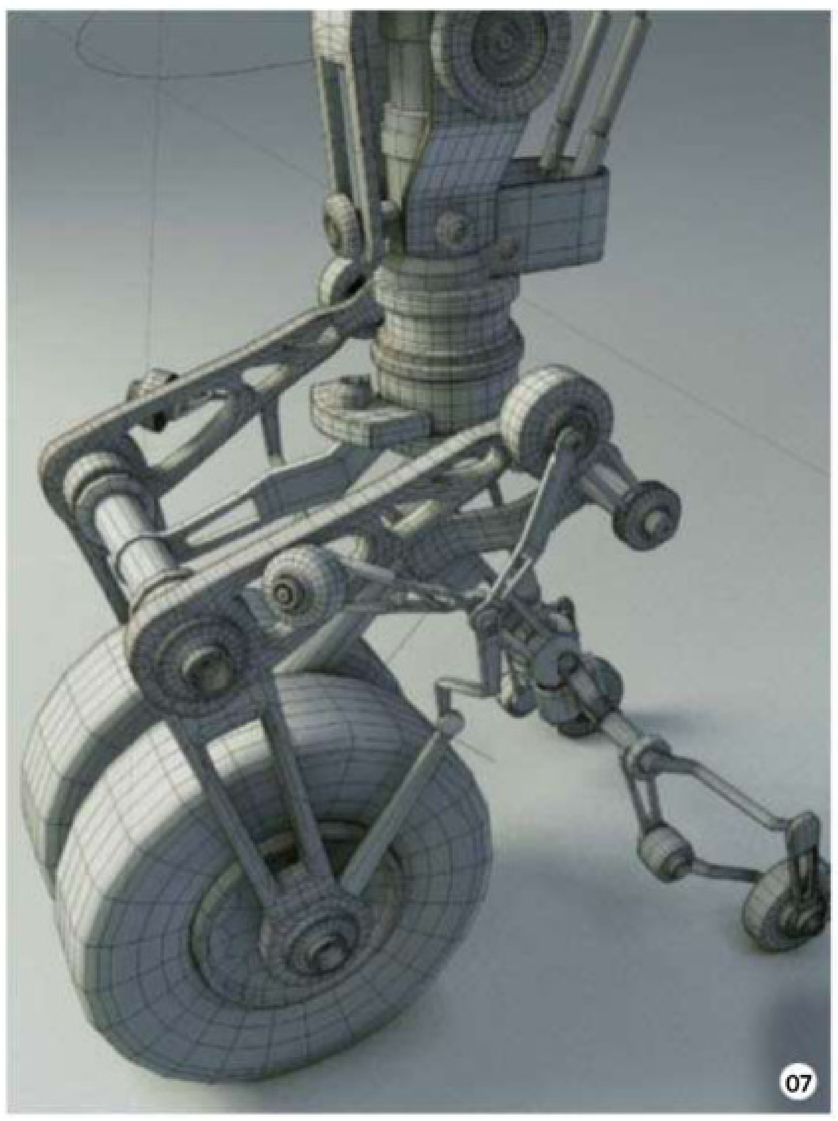
04 Find references I can't stress enough how important it is to find references when approaching complex machinery. All the mechanical parts that must be able to rotate on multiple axis (and obey logic to some degree) demand our attention down to the smallest details. Therefore, I want to encourage you to prepare a folder with references that relate to robot machinery – industrial devices like welder robots, aeroplane chassis, links, wires and so on. Even everyday items like a litter bin can be a source of inspiration and reference!

05 Block out the rough forms Load the sketch into Blender as a background image and start blocking out the forms. We'll use the cubes and perform basic modelling operations, such as Extrude, Inset and Bevel to quickly re-create the base mesh according to the sketch. Enable Mirror Modifier to speed up this process. It's likely that you'll face the problem of a fake perspective in the sketch – play with the proportions of a certain parts of the model and tweak the focal length of the camera (or the viewport) to compensate for this.





06 Model the small details After the base mesh is established, it's time to swap out its parts one by one for more detailed versions. For example, at this stage the wheel of our robot is represented by a low-poly cylinder. We need more detail than that, so let's refer to the folder with the images that we've prepared. Some kind of chassis should work here, so model it according to your reference, place it where it should be and move the low-poly part to the hidden layer. Using this technique, swap out all low-poly parts for detailed elements.



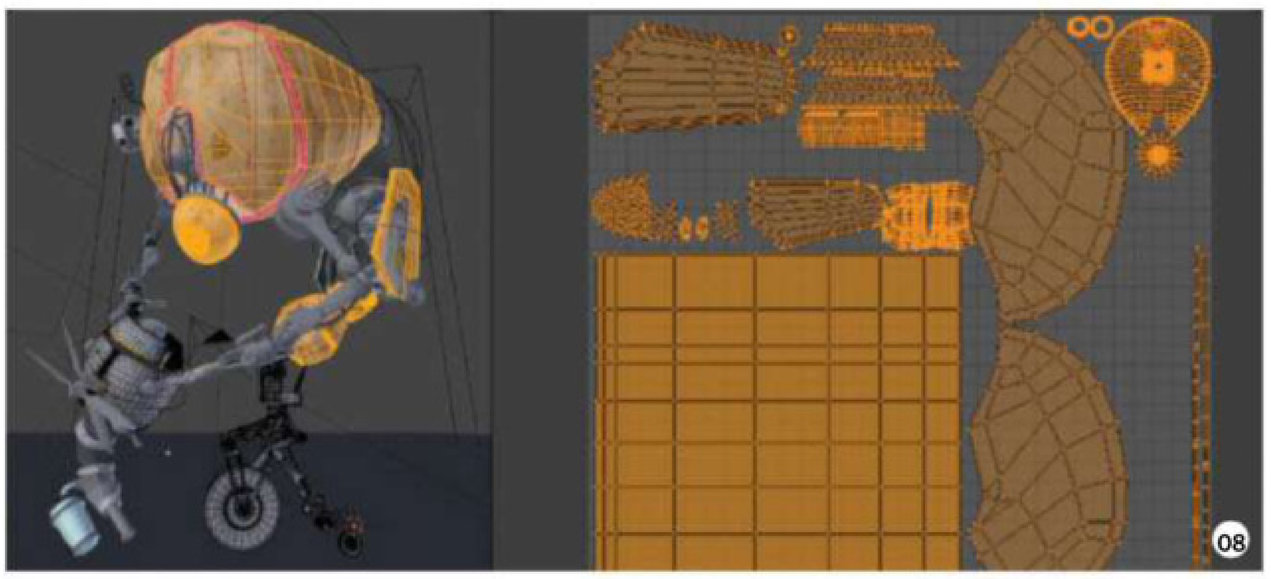
07 Focus on even finer details Evaluate your detailed mesh – are there any parts that could benefit from even more detail? Perhaps you could emphasise the scale of the model by using such details? If the image is going to be 5,000 pixels wide, it will also mean that every single nut will be completely distinguishable, so you'll need to get in there and add details like wires and bolts where you think they're needed.

Plan models according to the textures

The model structure and its polygon count influence how we'll approach texturing. For example, if we plan to texture metal parts procedurally, why bother with quad-only topology and UV unwrapping? NGons and triangles would be completely fine in this case. Another feature of procedural texturing is that there's no need to consolidate UVs or join the models. Conversely, if we plan to unwrap certain parts of our model to one UV map, then we really need to think about how we approach topology and plan Subsurface modifier iterations and creases. We need to take a safer approach to modelling.

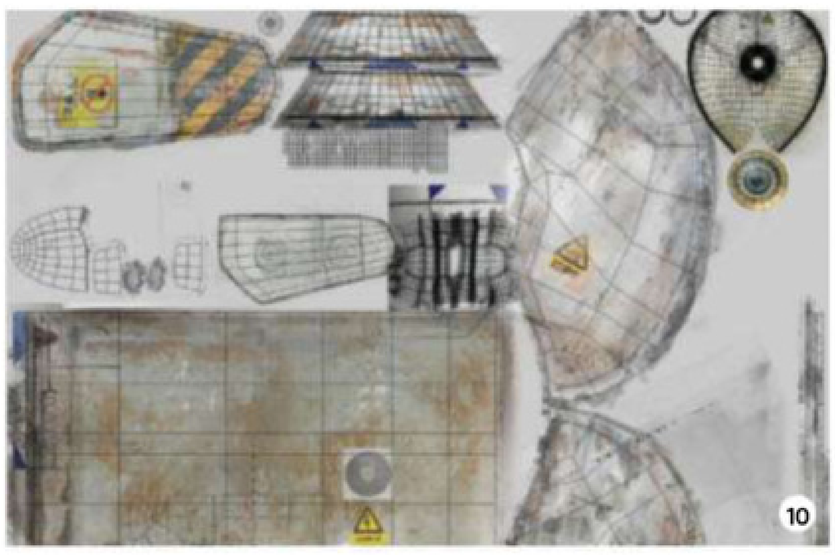
Concept

The concept for the artwork is based upon the silhouette generated in the free sketching program, Alchemy.



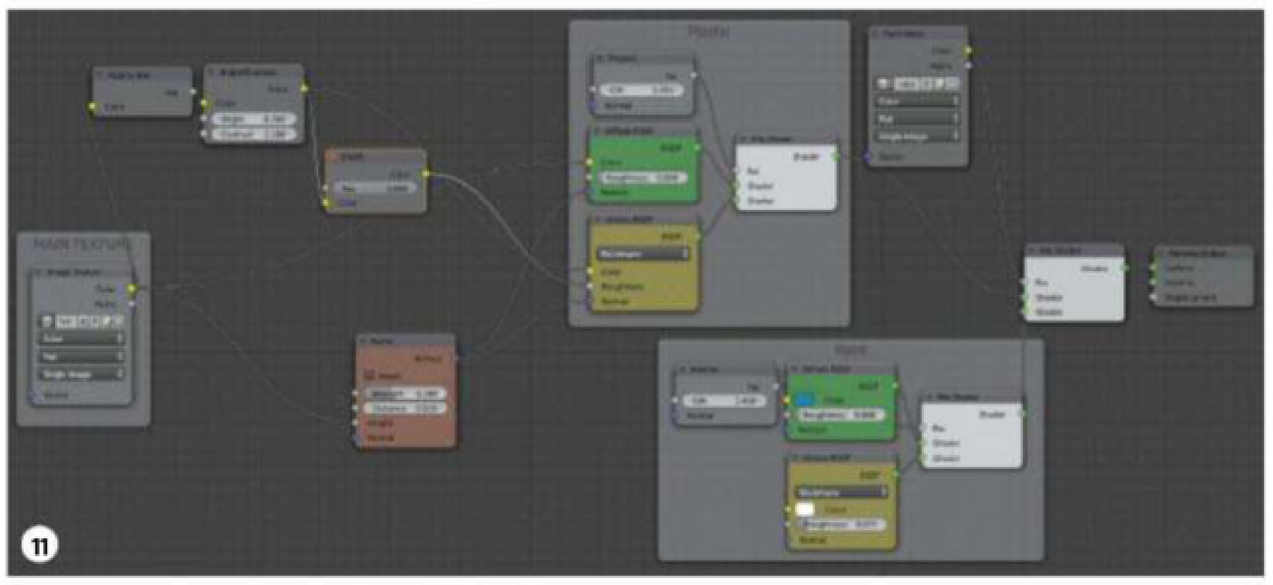
08 Unwrap the models For simplicity's sake, let's divide our materials into two different categories. The metal parts of the robot will use procedural textures, and for the plastic parts we'll paint the textures by hand. Obviously, in case of UV-mapped textures we first need to unwrap the models: ideally this should be done on one UV map. Let's activate the Texture Atlas add-on and add all the parts that will share the UV map to the new Lightmap group. Press Start Manual Unwrapping (now all model parts should appear merged), unwrap the model and press Finish Manual Unwrapping. The result of this procedure is that we should have all model parts unwrapped to one UV map, then separated.

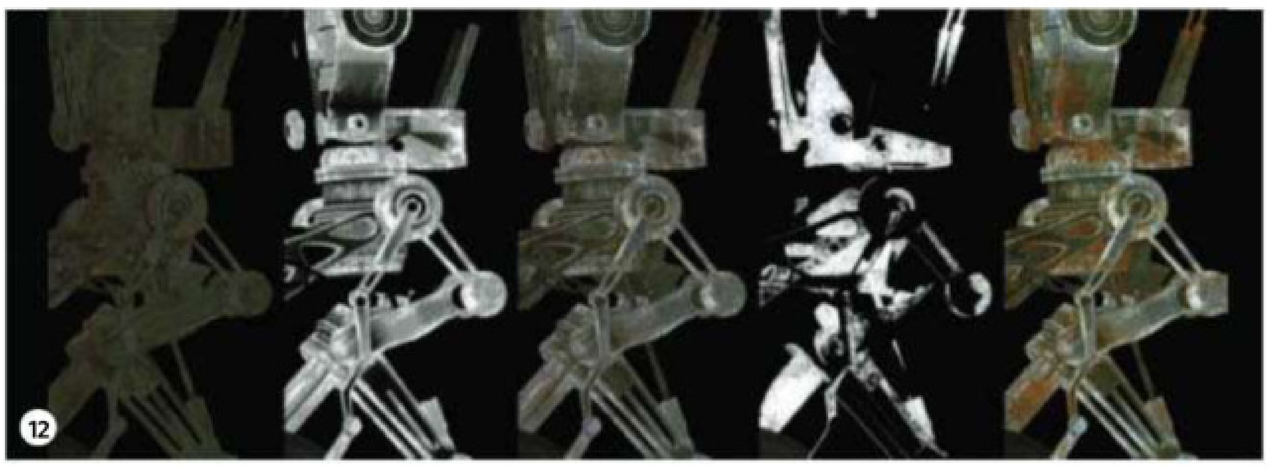
09 Bake Ambient Occlusion Before we begin the painting process, bake an Ambient Occlusion pass. It will serve as a guide for texture painting. It can be done using Vertex Colors and a Cycles Baking add-on (this method requires Cycles Baking Branch, which can be downloaded from **www.graphicall.org**). If your model has a Subsurface modifier enabled, copy the model then apply all modifiers. Switch to the Vertex Paint mode and press Paint>Dirty Vertex Colors. Plug in the Vertex Color material node to the Input of the Emissive shader node, set Bake Type to Emit and press Bake.



10 Paint the texture Export the UV Layout from Blender, import it in the image editor and start painting the texture. Don't forget to utilise the freshly baked map – it will come in handy for the Edge Detection, as Dirty Vertex Colors should have revealed the position of the edges, as well as the crevices. Now we can overlay the Grunge texture on top of the Dirt map to make it look more natural. For the texturing, I recommend surfing the web and downloading a bunch of textures that you think will work well, such as peeled paint, rust, plating and different signs (such as warning signs and so on). It's then just a matter of layering these images using the Dirt map as well as the UV layout as a guide.

11 Set up the plastic material The material for the plastic parts is straightforward (despite the intimidating screenshot to the right). The image is being plugged into the Color slot of the Diffuse shader, while its inverted copy goes to the Roughness input of the Glossy shader. These two shaders should then be mixed using Fresnel as a factor. Next, a Blue Paint shader is added on top of this base material. The Bump map is made of the same image texture being plugged into the Bump node, then into the Normal Input of every shader.





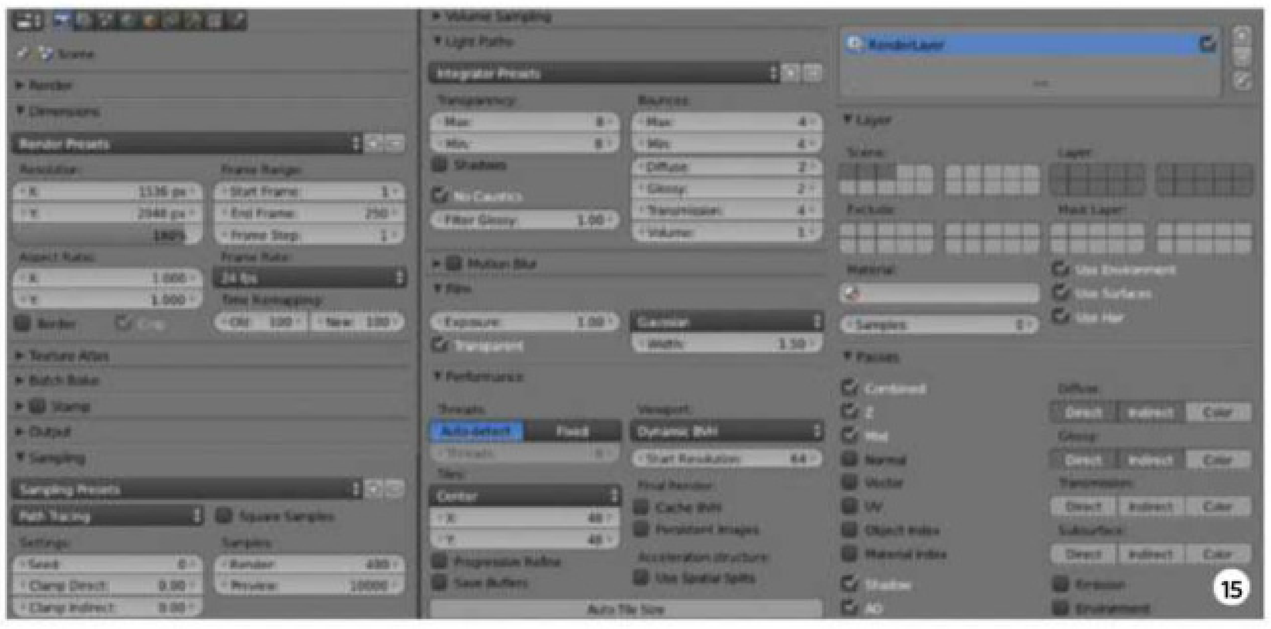
12 Procedural textures Now we're going to make a material for the small metal parts of the robots. The textures for this material are going to be projected procedurally using the Object Texture co-ordinates. We'll need our textures to tile without a seam. The easiest way to make a texture seamless is to use a GIMP filter called Map Seamless. The structure of the material is that we'll make three sub-materials and mix them together using Dirty Vertex Colors and Musgrave procedural noise. Make a Dark Metal material, mix it with a shiny light metal on the edges of the geometry and add a Rust material using the Musgrave procedural noise.

Use the Batch Bake plug-in

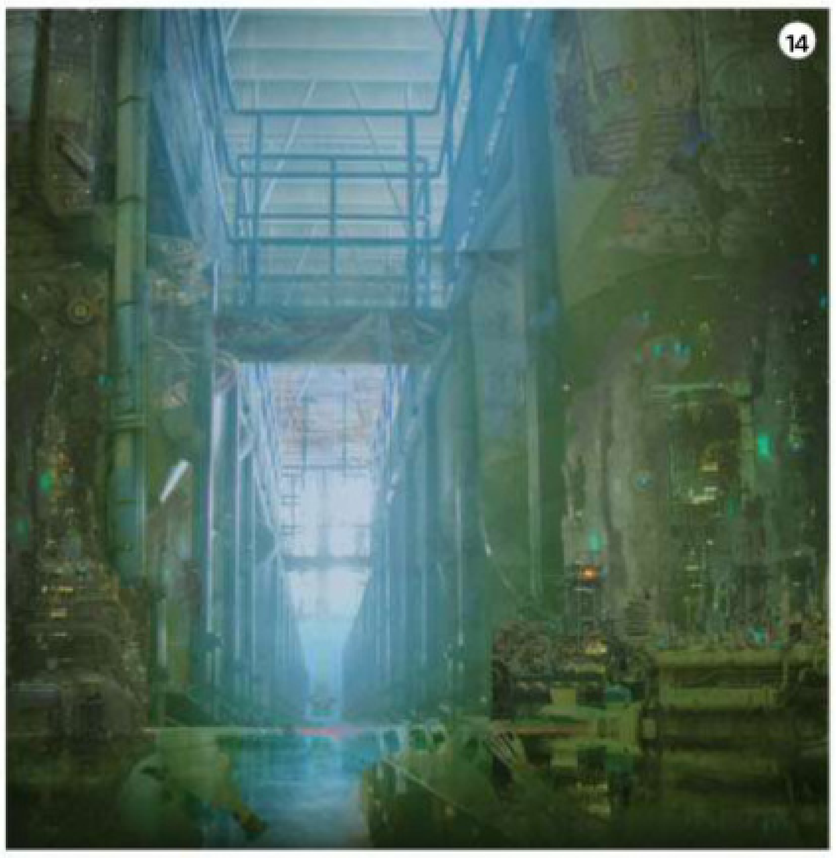
There are many ways to bake Ambient Occlusion in Blender. We've discussed the baking of the Dirty Vertex Colors with the new Cycles Baking feature, but it's still an experimental feature that's not included in 2.70 yet. There's an add-on called Batch Bake that allows us to get the same kind of effect, but not depending on the Vertex Colors and the polygon resolution. It auto-unwraps all the models to the chosen UV map, then bakes the Ambient Occlusion.

13 Set up the lighting Before finally rendering the model, set up the lighting. The first component that we need is ambient lighting. For the purpose of creating very soft lighting and, at the same time, very pronounced reflections in the glossy parts of the robots, plug in a HDRI texture to the Color slot of the Background shader. The second part is the main light source, which will illuminate the robots from the top. The final touch of this lighting setup is the rim light. Create an area light and place it to light everything from behind, to get the kind of backlighting as seen below.

15 Render your model Let's set Diffuse and Glossy Bounces to 2 in the Light Paths settings. It will speed up the render, while having a minimal influence on the overall lighting. However, consider leaving Transmission Bounces at a higher value if you have refractive materials in your scene. To compensate for the darkness of the shadows, we can now boost the Gamma parameter in the Color Management settings. Make a test render at 50-200 samples using Path Tracing, then disable Caustics and compare the results. If there is considerably less noise in the image, think about disabling Caustics. After this make another render with Filter Glossy set to 1 and again compare the results. It's quite likely you'll want to leave it at 1, because we have a lot of shiny machinery that will be really emphasised with this setting. After you have successfully reduced the noise, activate Image Passes, hit Render and sit back while you wait.



14 Paint the background Right before the render, we should decide whether we need a background to be directly integrated into scene or whether to leave this for post-processing. How to decide? If you have large reflective surfaces in the scene, such as a wet floor, or want your robot to capture the highlights of the particular backdrop, then create a matte painting in your image editor, then add a plane with the Emissive shader and insert this image as a texture. Don't forget to disable the Shadow check box in the Ray Visibility tab, or this plane will block the light from the background.



16 Colour grading It's when colour grading that the image really comes to life. First of all, try tweaking the curve values to colour balance the image and to see what looks best. Colour lookup tables work really well for quickly testing various moods. For example, while zapping built-in Photoshop LUTs, we can create some really unexpected results that could push the picture in a surprising direction. After colour grading, place some atmospheric fog images behind the robot to enhance the impression of the depth of field and also to separate the figure from the background. Set the Opacity to a lower value to make it barely visible – somewhere between 5 and 15% is a good choice.

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I made this...

Incredible 3D artists take us behind their artwork

Jean B. Vendamme

Website www.thedoberman.deviantart.com
Country Ireland
Software ZBrush, Photoshop
Bio Jean is a French designer based in Ireland. He's just started out in the world of 3D art

"For the texturing process, I first created and edited brushes, modifying the direction and scattering. I then started painting, respecting the direction and length of the hairs. I finally added some random hairs one by one to give it a more natural look"

Platon 2014

I created this image to train myself in ZBrush, attempting to transpose an old design of mine into 3D. I didn't dare attempt to use FiberMesh for the fur, so I did all texturing in Photoshop.

Step by step

Easy-to-follow guides take you from concept to the final render

Alex Novitskiy

3DArtistonline

Username: Tigersfather

Personal portfolio site www.arttalk.ru/profile/Tigerfather

Country Ukraine

Software used MARI, Unfold3D

Expertise Alex specialises in visualising, modelling and texturing vintage vehicles

High-resolution texturing in MARI

Pfalz D III 2014

Discover how MARI can be used to paint highly detailed textures onto your models

Alex Novitskiy is a CG artist and an instructor at the CGTarian online school

In this tutorial we will discuss the use of MARI to create high-resolution textures. In this example, I will use my model of Pfalz D III aeroplane from WWI. As you'll see, texturing even complex models is not a daunting task.

I have tried to explain the process in as simple a way as possible. It's important to remember that texturing is something that can be really enjoyable, so be experimental and have fun!

First, a note – preproduction is incredibly important. The basic texturing problems encountered by many tend to be due to a lack of planning. Carefully consider what you intend to do, particularly during the modelling stage. If you have a good structure and a good plan of attack, then you'll feel comfortable in your texturing and you won't have to constantly return to the original geometry to make tweaks.

From an aesthetic perspective, you must also fully visualise the final result that you're aiming to create. For instance, if you want to make an object that has been used in some way, then you must understand how this object was used and for how long. What kind of dirt, rust, scratches and damage might have accumulated on the object? Texturing requires thought, so examine your references carefully.

Finally, remember that everything you learn in this tutorial can be repeated on any model. If you understand the logic of the texturing process here, then you will be able to apply it to any other projects you work on in the future.

With the Disc

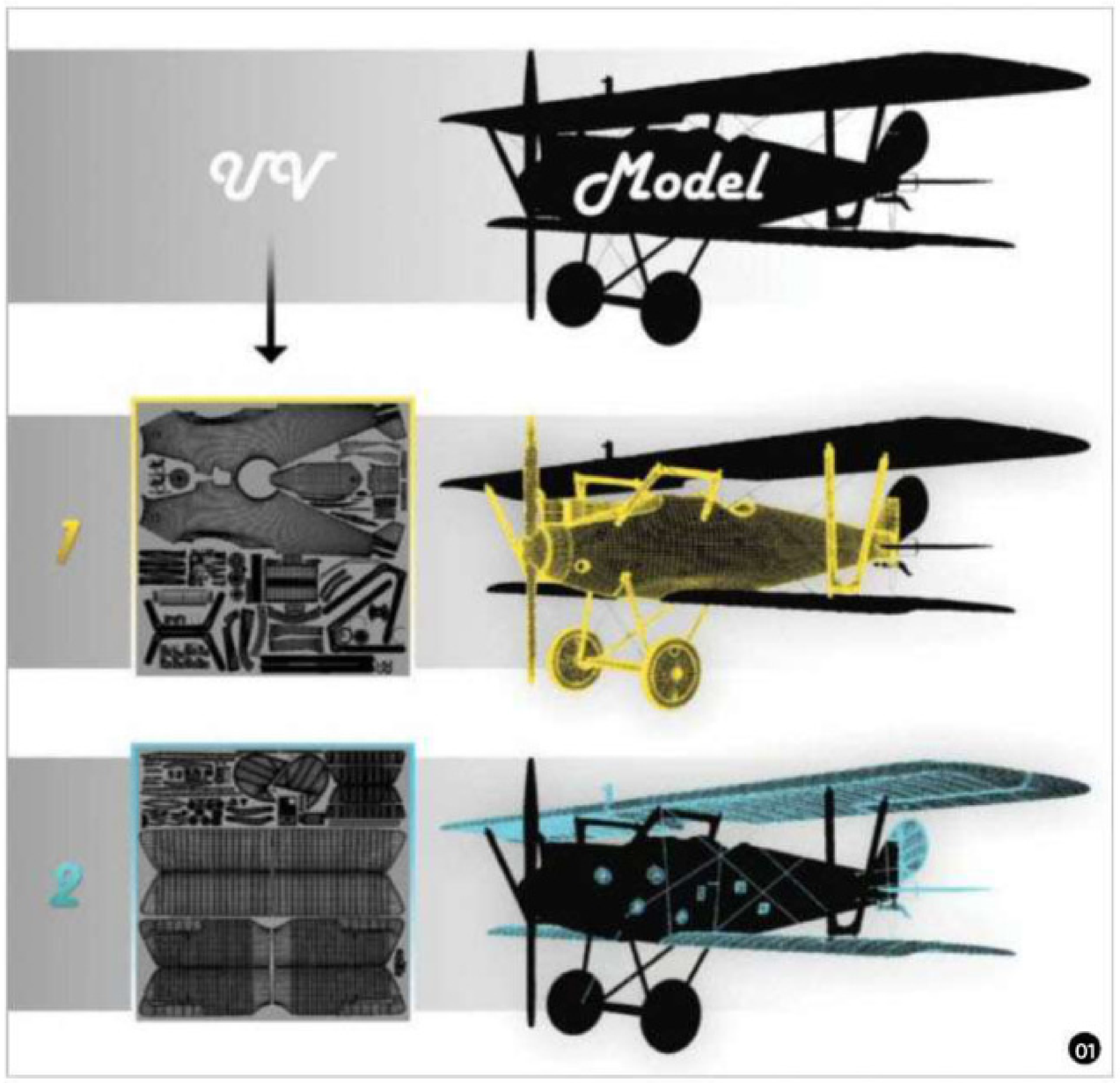
Tutorial files:
- Tutorial screenshots

Concept

This texturing project is based on an aeroplane from World War One. It's important to check and compare references from the time period to ensure that the final image you create feels believable and catches the attention of the viewer.

Learn how to

- Prepare your work
- Use menus, layers, hotkeys and other useful MARI features
- Explore various painting techniques for dirt and scratches
- Work with images by loading and painting through them onto the model
- Use different brush types for varied results
- Bake maps and textures by layers



01 Structure your work The first thing you need to do is to sit down and think about how you're going to approach your project. You must also make sure your model is clean and ready for texturing. Once you're ready, unwrap your model. I used Unfold3D for unwrapping. In my case, I broke the body of the aeroplane into two UV groups. You can see in the attached image how each map will be used for the various parts of the model.

How many MARI layers?

To understand how many MARI layers you need, you must to understand the logic of layer creation. We know that at the end stage we need three maps for each UV, but we can make more layers with MARI, and some of them will be combined into one map. The logic is simple. First, we draw the base texture and separate it into two layers: the fill layer with basic colour, and the layer with painted elements. This will make our life easier if we ever need to change or correct something. We can also export the upper layer only as a Diffuse texture and make the base colour with a material using masks. Next, the Dirt can be divided into two or more layers, which will be saved as one. It will make the drawing process easier and more flexible. In the example below you can see two layers because of the different types of Dirt, which I mixed into one at the end. Last of all, the Scratches. This is very simple – it's just one layer with scratches. Everything is very basic, so the only point left is the painted symbols on the fuselage and wings. We need to draw these using Photoshop. Save them without a background in the PNG format. After this, you can easily use them in MARI.

02 Decide on your maps Now we need to figure out what maps we will need for the project. To do this, we need to think about the end result of the work and what we need to do to get to that stage. In the accompanying image you can see the maps I chose for this particular project. I used three maps (three maps multiplied by two groups, so six maps in all). These were Diffuse, Dirt and Scratches, which should be more than sufficient for a good result for this project.

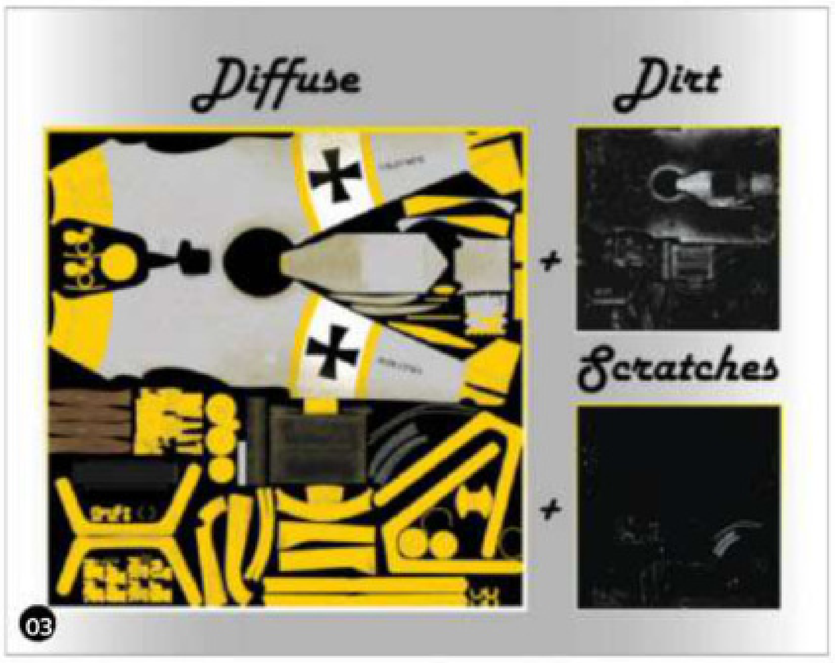
Artist showcase

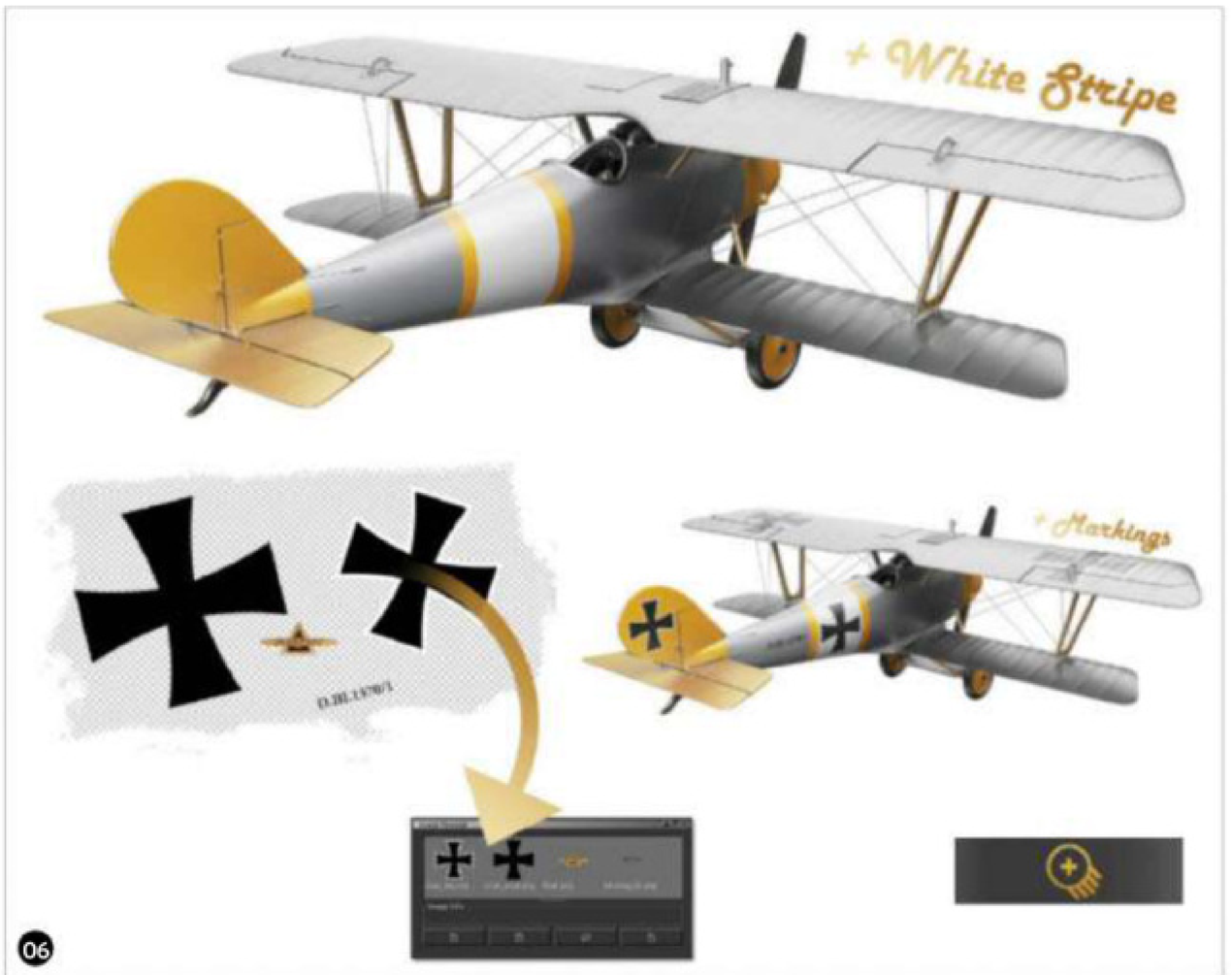
Alex Novitskiy

I'm a computer graphics artist from Kiev in the Ukraine. I am currently working as a modelling instructor for the online CG school, CGTarian. Using my skills in modelling, visualisation and texturing, I like to re-create many old things. These projects can range from vintage aeroplanes to cars. I'm also really passionate about old music!

On the Run **Maya, 3ds Max, V-Ray, Photoshop (2012)**
This scene was inspired by Seventies movies. The model of the Ford Falcon is very highly detailed. The streets have three UV parts with textures.

Buffalo concept car **Maya, ZBrush, V-Ray, Photoshop (2011)**
This was rendered in V-Ray and the cliffs were made in ZBrush. I tried to depict the evening heat of the canyon.





03 Create the paint layer Creating the paint is probably the most enjoyable and easy step, but it's also vital to get right. In this part we must create the Paint layer with basic colours and symbols. To start off, ensure that you have the following menus on MARI's display: the Brush editor, Painting and Projection, Image Manage, Objects and Selection Groups, and Layers. If you feel that working with this many menus open is inconvenient, you can put part of them in one clutch. Next, you need to load your model. Be careful – you should load it in accordance with the UV. If you have two UV parts, divide your model into two OBJ files. Each object inside of each part must have a unique name. Observe the structure and hierarchy, as it's very important to respect the order. It's hard to find something when your objects are named with random symbols and you have more than 100 objects. Try to write a correct name, similar to the object's real function. This will make the process much simpler. Remember when working with geometry that you can add a new object or replace an old one at any time. All you need is to keep your geometry with unique names and in logical order.

04 The fill layer Before texturing, make sure that you check the resolution. Ctrl/right-click on the model's UV and choose 16K or 8K for a high-res texture. 16K can be higher than you actually need, but it's great for detail control during the creation stage in MARI. Next, create a new layer for both geometry groups and call it Paint. In this layer, create all the painted elements on the aeroplane except for the fill colour. Make a solid colour with the Base layer by Ctrl/right-clicking on the selected geometry, and then use Patches>Fill>Foreground\ Background. Use this process to fill all elements for the plane.

Jeep Jeepster 1998 **Maya, V-Ray, Photoshop (2014)**
This was a model made for a customer. It was rendered using V-Ray. The idea for the winter environment and Northern Lights came at the last moment. The ice was made with ZBrush.

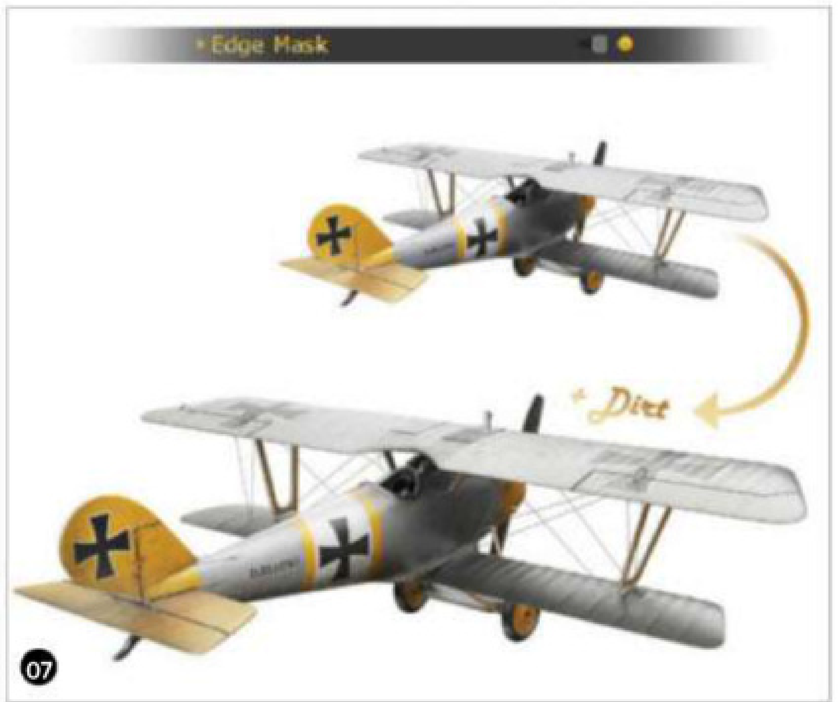
05 Paint on the selected areas Next, use the Marquee Select tool to fill in the desired areas with yellow paint. Select the desired areas and paint them with the Basic brush. Remember to work using the workflow that best suits you; you can select the desired areas not only on the model itself, but also on its UV should you wish. It's important to remember to bake all of your actions into the texture by pressing B or by changing the Bake Behavior to AutoBakeAndClear in the Projection menu. Personally, I prefer to work with ClearOnly Bake Behavior. If you are using the Manual baking option, don't forget to clear the paint buffer.

06 Add further stripes and decals The next step is to add the plane body's white stripe, using the same process as in the previous step. Following this, we want to add the decals to the plane's body and tail. This can be done using Markings Projection. First, create the images using Photoshop, and then add them to the Image Manager. You can then simply drag and drop the images onto your model in MARI for painting. To scale the images use Shift and Cmd/Ctrl, to move the image hold Shift and to rotate hold Cmd/Ctrl. Using these functions, place and prepare the decals on the model. Add some photo textures of leather and wood on the cabin and propeller using the same method.

5 hours creation time
Resolution: 6,500 x 2,655

Information on dirt

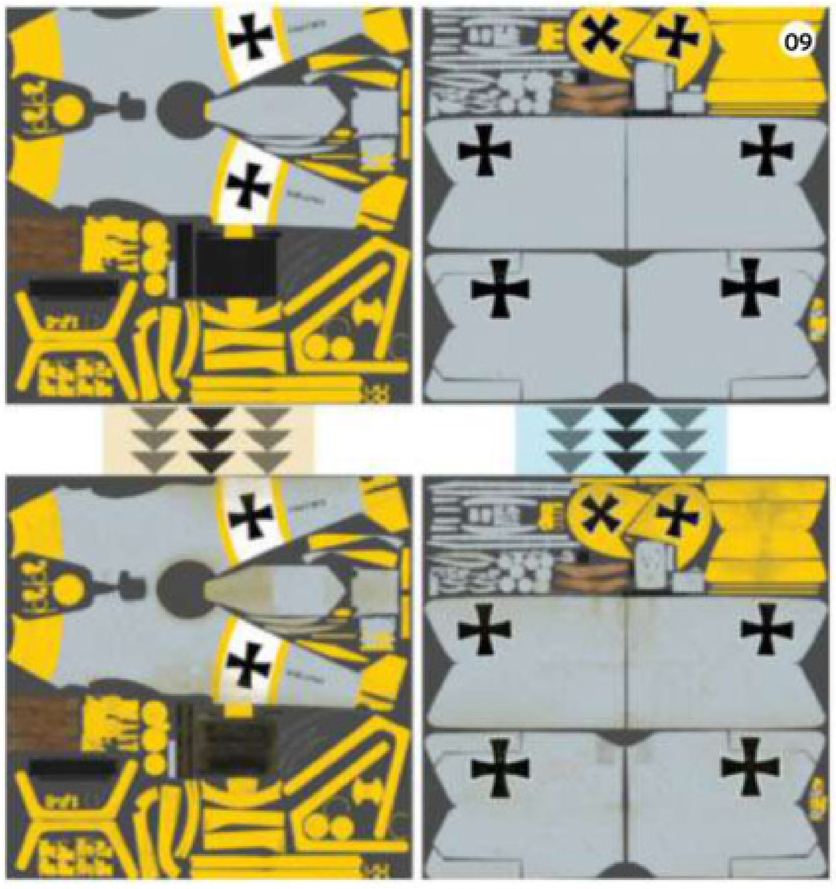
When creating the dirt, you need to remember two points. First, the dirt must lie unevenly – where you place it depends on what parts of the machine are prone to getting more dirt on them. Second, it's better to make the rust and other effects on different layers. This will give you the ability to place them below the base dirt layer afterwards.



07 Paint the dirt Paint the dirt without the help of any extra tools: it's best to use only your hands and a few organic brushes. You don't have to do it this way, but it usually results in a more realistic look. Before you start, it's a good idea to turn on the Edge Mask in the Projection menu. This will make the borders softer, depending on your camera position. For a good result, make two layers with dirt – one with dust and dirt and other with smoke and rust – then mix them into one, using the method mentioned previously, and bake them into one map. When creating dirt, try not to use a solid black colour – add some brown, as this is more natural. Dirt can also fill scratches on a surface, so make scratches in a dirt layer using the dark paint.

08 Use brushes The brushes you use for this project are up to you, but you can see in the accompanying image the brushes I used to create this piece. Make sure that you use more than one brush to achieve a more realistic-looking dirt. With rust and smoke, things little get a little more complicated. Rust has a different structure in some places and the effects of smoke depend on its source. In this example, for the rust spots I used organic brushes and for the smoke I used both hard-surface and organic brushes. To achieve a good rust and smoke, try to use many varied brushes. I prefer the organic brushes for all parts of this step except scratches. However, as I mentioned, I can't say that any one brush is better for this process than any other. It's a very personal thing – use whichever one feels most acceptable to you. It's more important to understand the logic behind your brushes and why it is you're using them.

09 Bake into maps Merge the Dirt maps with the paint layers and save them as a Diffuse map. Save the dirt separately for the mask – it should be used as a cool dirt effect in the blend shaders. You can also save the textures in one file with Photoshop. It may help you in the future, if you don't want to open MARI at any time to make changes.



10 Paint scratches This part is simple, but it can be easy to spoil the final result, so be careful. I'm talking about some common mistakes: scratches that feel too uniform, too big or too unnatural, or in unfeasible locations. Simply put, at this step it's very important to understand the design of a particular model and to know what areas may be scratched. For instance, it is important to ask yourself what material you have under the paint. In my case, the scratches are arranged in the front part of the aeroplane, as these areas are made of metal. Add the scratches with a white-coloured hard brush to make the Scratches map. To finish, create a blend shader in V-Ray and place the Diffuse with Scratches under the Dirt by using masks.

11 To conclude When working with textures made in 16K resolution, it's better to decrease the resolution before saving rather than increase, otherwise you will lose some of the quality. In this instance I saved the image in 8K for non-close-up renders. When texturing the engine, cockpit and guns, use the same techniques as with the aeroplane itself. In fact, using the techniques described here you can texture any vehicle you like of any size. You can even make everything simpler with V-Ray Dirt, for example. All you need to do in this case is to draw areas filled with a white colour for masking.

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Sculpt facial muscles on a skull in ZBrush

"Learn how to add anatomically correct muscles to a skull model"

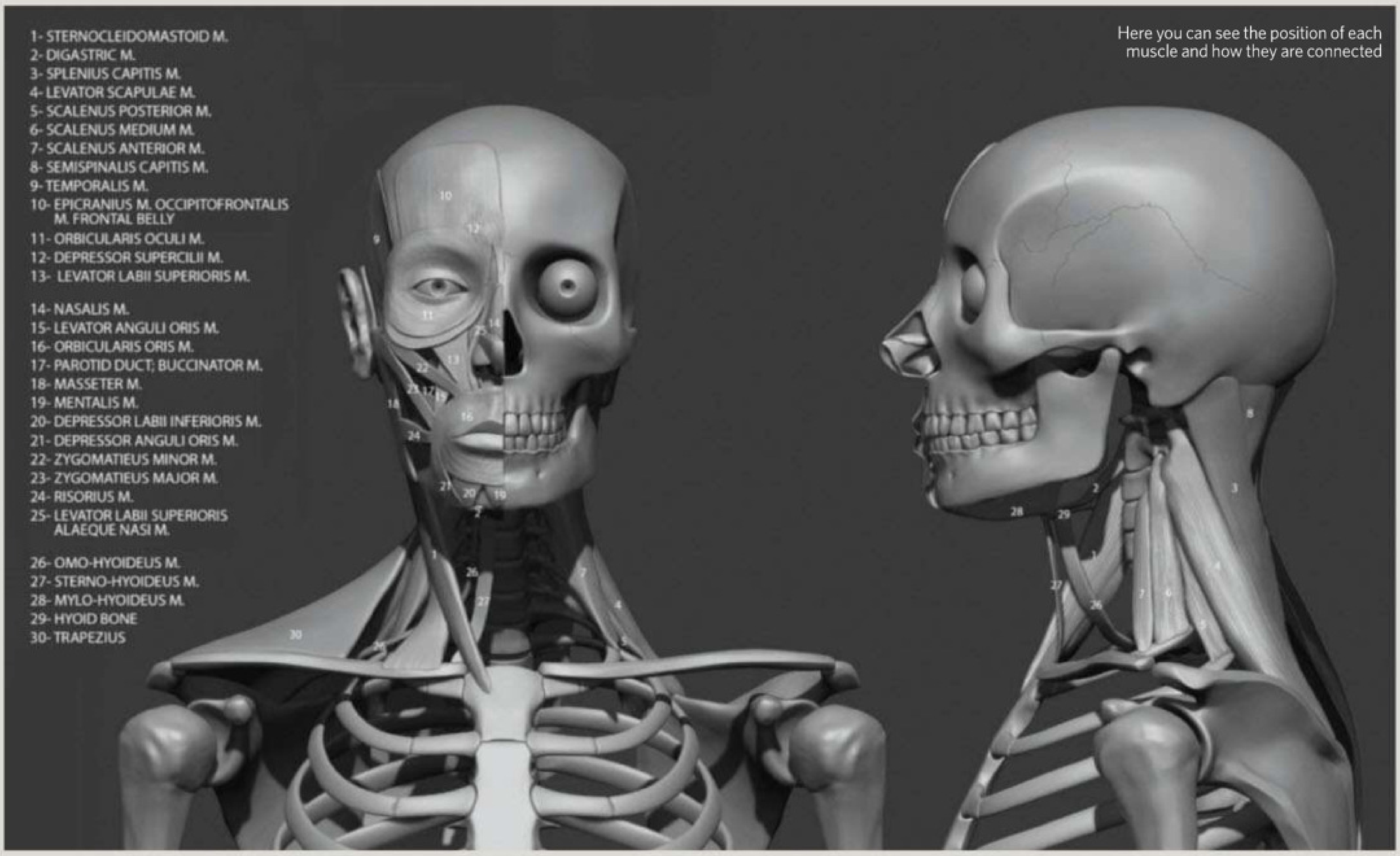
Welcome to my new tutorial series on sculpting muscular anatomy in ZBrush. We will be start by adding this musculature to skull and neck, and in later tutorials will go on to cover the rest of the lower body.

A long time ago, when I started learning about human anatomy, I picked up a lot of my knowledge from a book called *Gray's Anatomy* by Henry Gray. Textbooks like this one can be a great tool, particularly when you're in need of a technical overview of the construction of something as complex as the human face. You really need to understand *how* and *why* the human face works the way it does before you make a start on anything. Make sure you take the time to study reference, paying close attention to each muscle and how they are joined with the bones, as well as with other muscles, before you even think about loading up ZBrush. Understanding anatomical theory really is key to successfully reconstructing a human face.

It's also worth doing a few sketches to help you better understand the various intersections of the facial muscles. Consider various écorché studies – figures drawn without their skin, showing the muscles beneath – and try and mimic them in your own sketches. A good way to approach this is to trace over a photograph using Photoshop. You can then overlay your various drawings on the original image using the layers system. This is a really useful way of understanding the position of each muscle and how they are connected with the bones through the tendons.

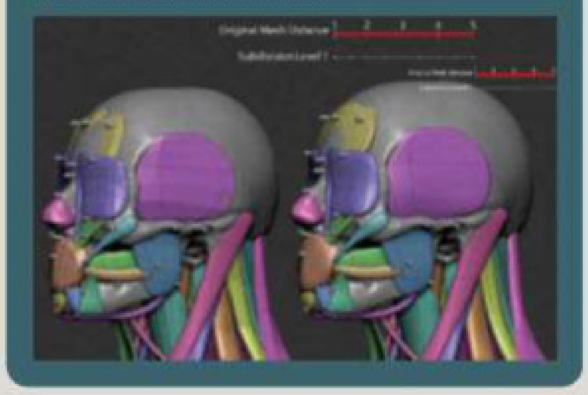
I must reiterate the point to really hammer it home – it really is paramount to investigate and learn as much as you can about human anatomy to develop the necessary knowledge required to identify each individual muscle. You may find it useful to use apps to quiz yourself on anatomy. The Human Anatomy Atlas is just one example.

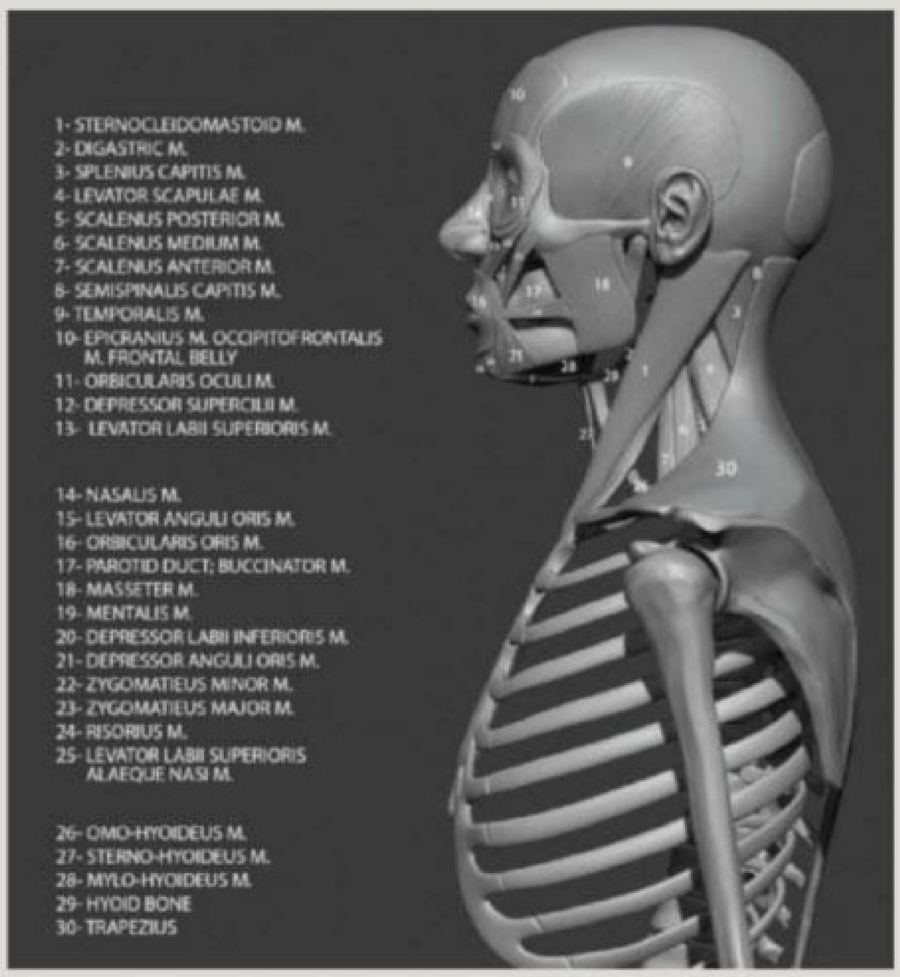
Once you feel ready, read on to learn how to add these muscles over the skull. Remember that there is a video tutorial to help you along if you get stuck.


1- STERNOCLEIDOMASTOID M.
2- DIGASTRIC M.
3- SPLENIUS CAPITIS M.
4- LEVATOR SCAPULAE M.
5- SCALENUS POSTERIOR M.
6- SCALENUS MEDIUM M.
7- SCALENUS ANTERIOR M.
8- SEMISPINALIS CAPITIS M.
9- TEMPORALIS M.
10- EPICRANIUS M. OCCIPITOFRONTALIS M. FRONTAL BELLY
11- ORBICULARIS OCULI M.
12- DEPRESSOR SUPERCILII M.
13- LEVATOR LABII SUPERIORIS M.
14- NASALIS M.
15- LEVATOR ANGULI ORIS M.
16- ORBICULARIS ORIS M.
17- PAROTID DUCT; BUCCINATOR M.
18- MASSETER M.
19- MENTALIS M.
20- DEPRESSOR LABII INFERIORIS M.
21- DEPRESSOR ANGULI ORIS M.
22- ZYGOMATIEUS MINOR M.
23- ZYGOMATIEUS MAJOR M.
24- RISORIUS M.
25- LEVATOR LABII SUPERIORIS ALAEQUE NASI M.
26- OMO-HYOIDEUS M.
27- STERNO-HYOIDEUS M.
28- MYLO-HYOIDEUS M.
29- HYOID BONE
30- TRAPEZIUS
Here you can see the position of each muscle and how they are connected

Using subdivision

Often, when we increase subdivision levels, it increases the subdivision level proportionally to the base mesh. If the original mesh has a length of ten centimetres with five subdivisions (five polygons) and the other mesh has a length of five centimetres with the same subdivision level, we'll see a big difference between them, as when we have the same subdivision between a long mesh and a short mesh, the longer mesh will seem to be a lower quality than the shorter mesh.





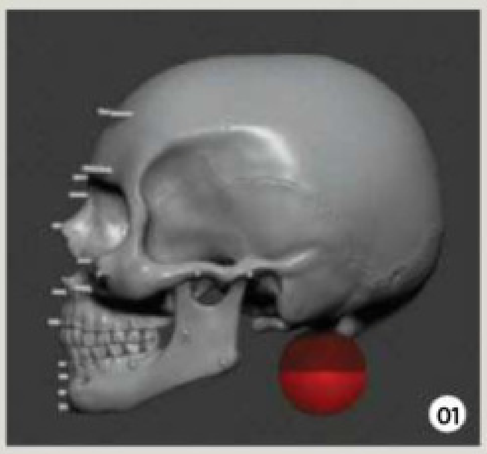
How to attach the facial muscles in ZBrush

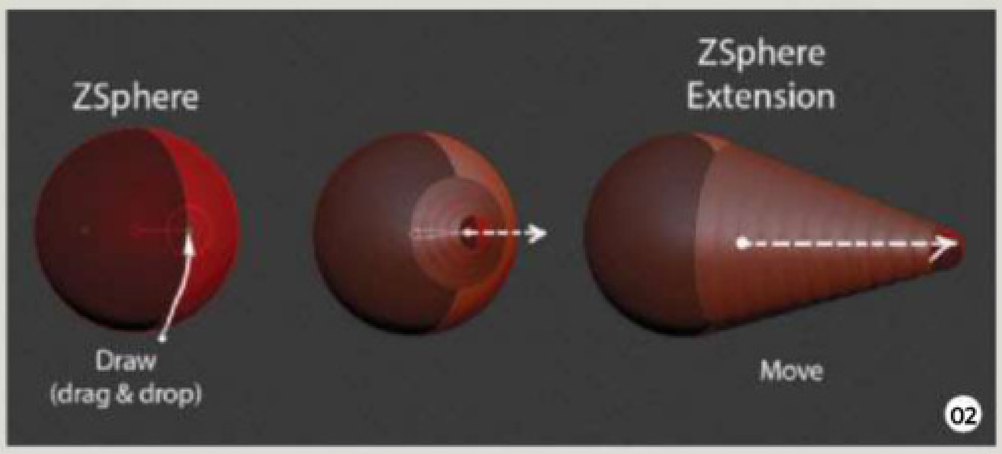
01 Add ZSpheres

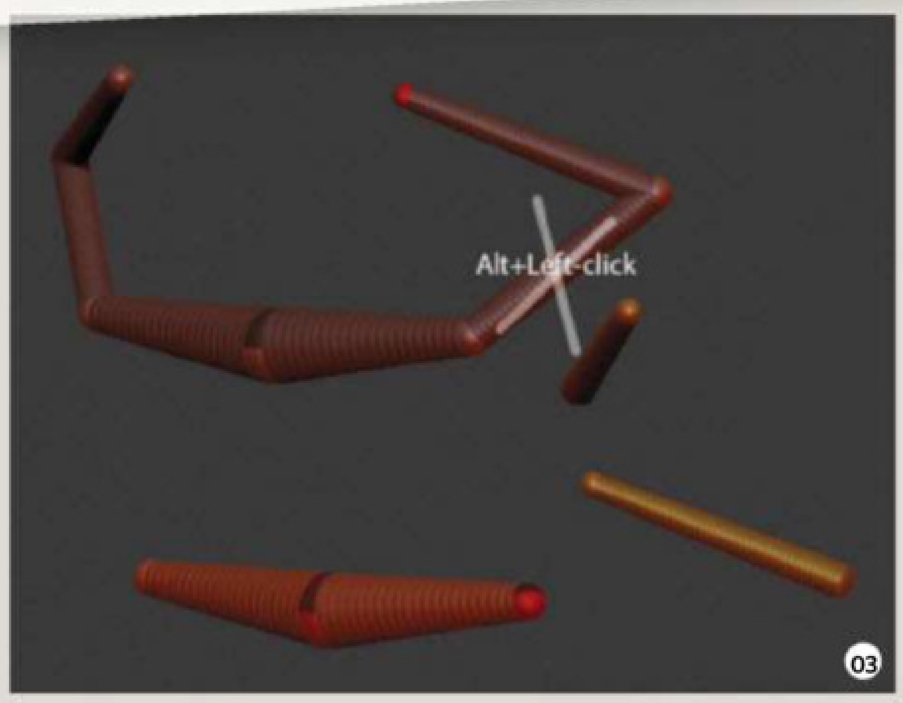
The best way to create muscles is by using ZSpheres. This is because this process creates separated muscles in different polygroups. The polygroups are the best way to get separated meshes. Go to Insert>Add a ZSphere. Then, go to Geometry>Position and change the Y-axis Position of this ZSphere so that it is positioned underneath the skull. Placing the ZSphere under the skull helps you to get a good feel for the shape and size before adding any extensions or modifications to its shape.

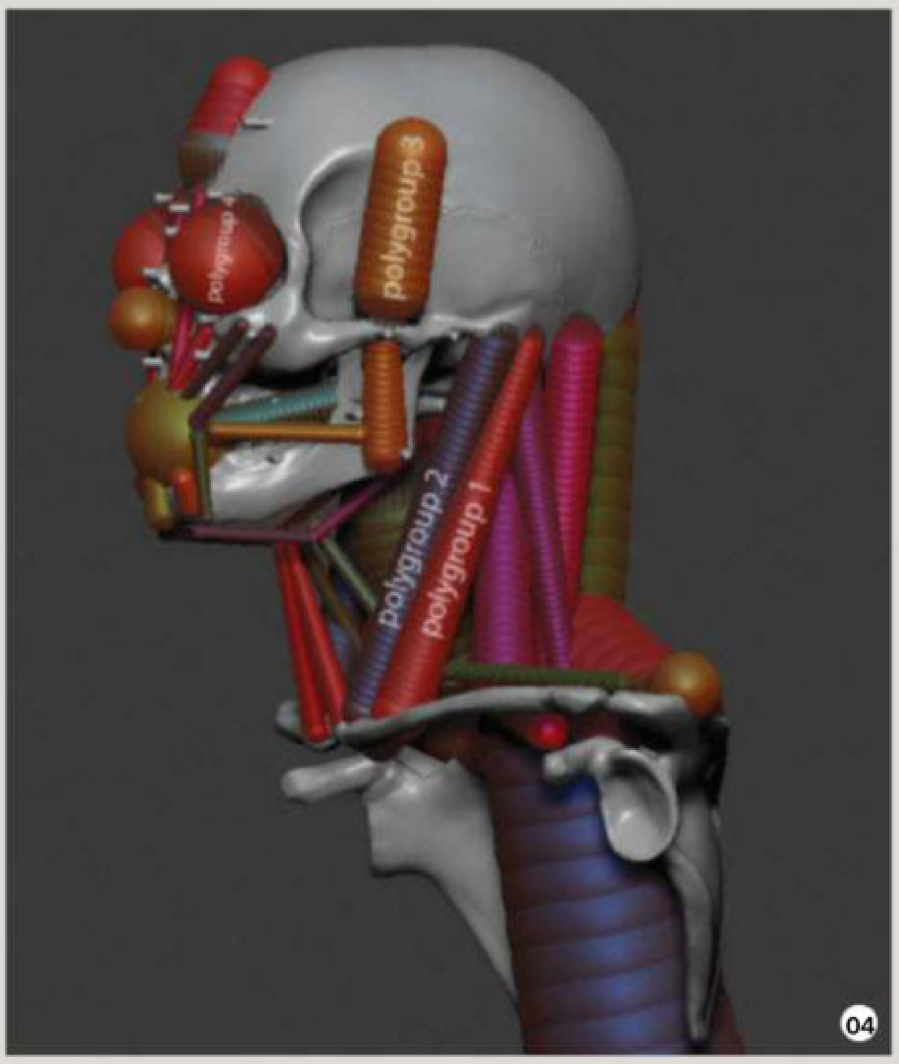
02 Edit the ZSpheres

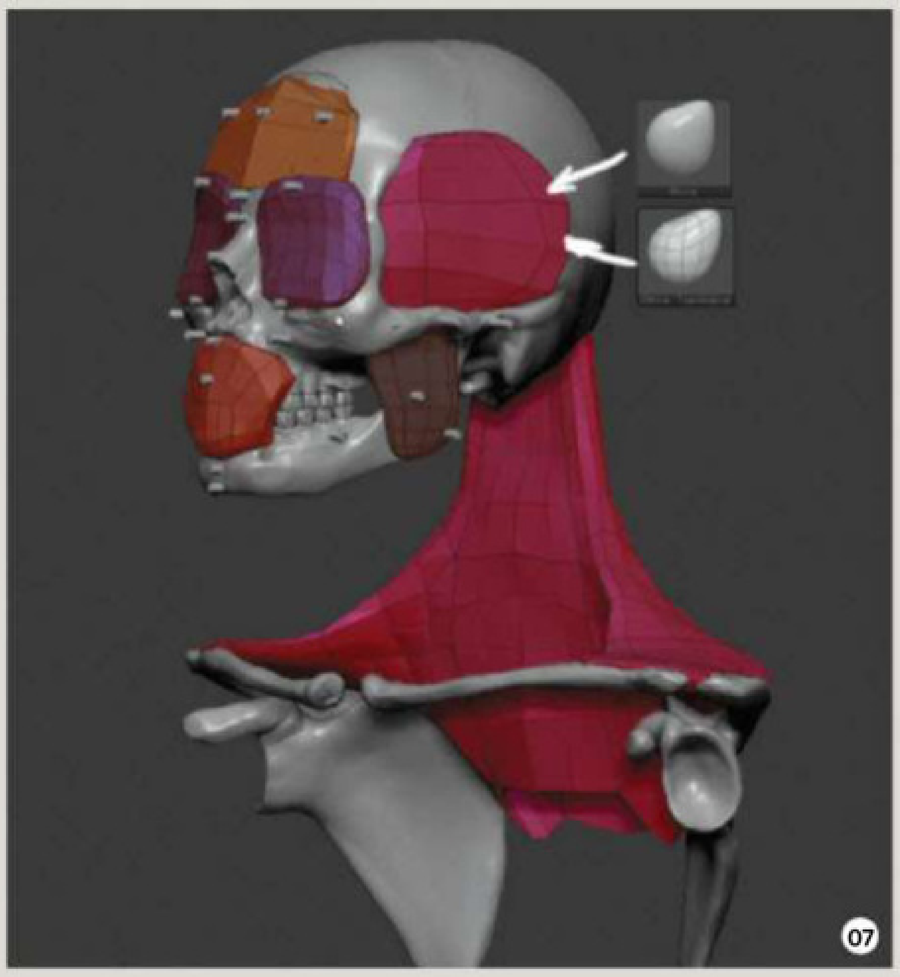
We can use different methods to create each muscle, but by using ZSpheres we can create separate muscles from the first ZSphere we made. In this case, activate Symmetry by pressing X on your keyboard to generate extensions on both sides from X-axis. First, go to Adaptive Skin and turn on Use Classic Skinning. Then, activate Draw and create the first extension by using drag and drop. This process will be used in the creation of all of the muscles in this project. Once you've done the first extension, move it around to separate it from the main ZSphere.





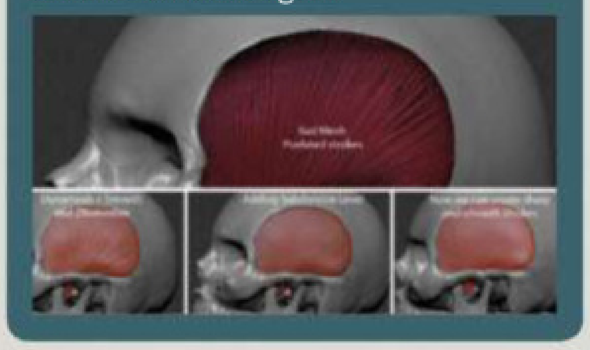


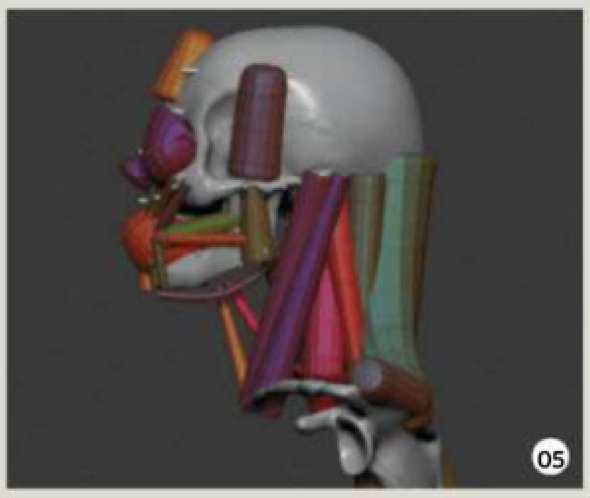




Improve topology

The process of retopology is really important, particularly as when we started sculpting, we used Move and other brushes to adjust the original topology, creating irregular polygons, with some larger than others. By applying more subdivisions to the mesh, it creates uneven surfaces as the base mesh has been manipulated. One way to reverse this is by cleaning our mesh using DynaMesh, which enables us to close any holes and to decrease the number of polygons. After this, we can apply ZRemesher and increase the subdivision levels again.





03 Hide sections from ZSpheres

This step is important as the process enables us to create separated polygroups and hide the connection between them. If we create extensions from a ZSphere, from each extremity we can create other new ones, but to hide some sections we need to Opt/Alt-click over the polygroup that we want to hide. In the accompanying image you can see the hidden sections – between the first ZSphere we have added one section, and from that section we have added another one. Then, the first section has been hidden by Opt/Alt-clicking over the section that we want to hide.

04 Understand each of the polygroups

Following the process used in the previous step, we need to create each muscle using ZSpheres. The ZSphere connections between each muscle should be hidden. We need to create a section (muscle) and if that section is near another muscle, we can use that extremity to create a new muscle, but the connection between the first muscle and the new one should be hidden. This process will help us to create separated muscles. Like before, to hide some sections, we need to Opt/Alt-click over the section that we want to hide. Use your references to create the muscles.

05 Go from ZSpheres to Adaptive Skin

Once we've added all the muscles using ZSpheres, it's time to convert those sections to a new mesh. Go to Adaptive Skin and click on Make Adaptive Skin. This will create a new tool called Skin_ZSphere. Now we can hide the SubTool called ZSphere, then using Insert we can add Skin_ZSphere between the SubTools. As ZSphere can't be used as a mesh, we need to follow this process so that we will get something like the accompanying image.

06 Flatten rounded meshes

As we've got rounded meshes, we need to flatten them to get a similar shape to the muscles. Use different brushes such as hPolish, TrimDynamic, Move and Move Topological. hPolish is perfect to flatten areas smoothly, and TrimDynamic is great to flatten areas following the curvature of the meshes. For example, the sternocleidomastoid muscle in the neck is a flattened muscle with a rotation between each extremity. To sculpt this muscle, we can use hPolish, following the curves, and with the help of TrimDynamic we can follow the curvatures previously created.

07 Adapt the mesh

For some muscles we'll need to use the Move and Move Topological brushes to adapt them to the necessary shape. The Move brush is great when you have hidden the other muscles. If you use Move while all the muscles are visible, you will move all of them. If you want to move each muscle individually, you should use the Move Topological brush. Another way to move the muscles is by hiding the other ones. In order to hide sections you need to hold Cmd/Ctrl+Shift and click on the section that you want to keep visible. This method will hide the other meshes and show just the selected mesh.

08 Position the muscles

The position of each muscle is fundamental and I recommend you read some books on anatomy to see how they are connected with the bones. We'll need to work with the brushes previously shown, trying to adapt the muscles according to the references. Once we're satisfied, we will need to increase the subdivision level by going to Geometry>Divide. Read the boxout on subdivisions for more information.

09 Subdivide single muscles

If some muscles still look quite low quality while others look great, select the poor-quality muscles and Cmd/Ctrl+Shift-click on them (bear in mind that different colours refer to different polygroups). Once you can see the individual muscle hiding the others, mask it. Once we have masked it, Cmd/Ctrl+Shift-click on the background. This will make all the muscles become visible again. Now, Cmd/Ctrl-click on the background. This will invert the mask, masking the other muscles. Go to Geometry>Divide. This process will divide this muscle individually from the others.

10 Alternative method

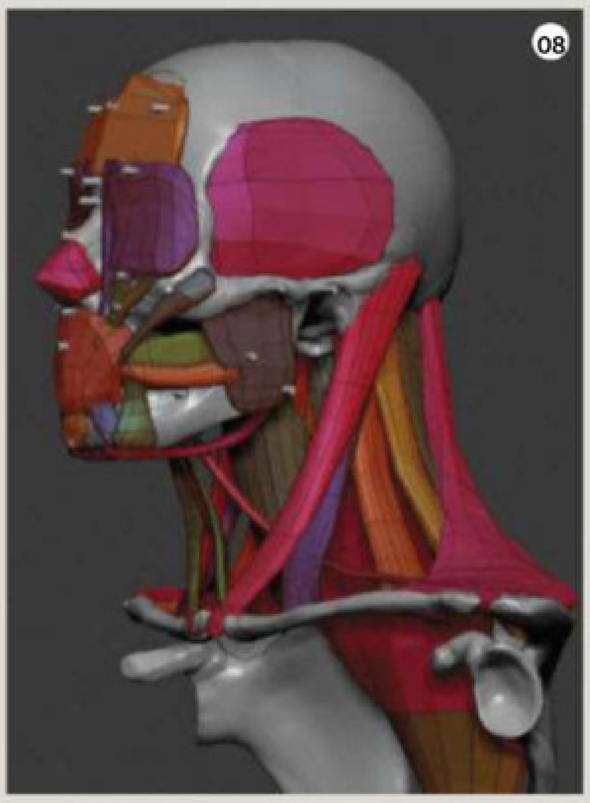
In the previous steps I used a creative method to build the muscles, which works well for a simple visualisation, but if you want to understand the structure of each muscle, you will need to create each muscle with separate muscle fibres using the Curveline Tube brush. To do this, select the brush and try to create the origin and insertion of that muscle fibre. Drag and drop it over the mesh of the skeleton and this will create a new polygroup for each fibre. By adding one fibre near others we'll build up a muscle structure.

11 Sculpt muscle fibres

For the creation of muscle fibres we'll need to select the ClayTubes brush with Alpha 59 selected. Go to Stroke and check Lazy Mouse and Relative, with Lazy Step set to 0.002. Now we need to hide all the polygroups, keeping the polygroup that we want to sculpt visible (as before, Cmd/Ctrl+Shift-click on the polygroup we want to keep visible). Using references we can draw the curved lines following the same pattern. Try to use the same draw size for all the sections to keep it consistent. It may be worth adding lines using the Layer brush to add more irregularities over the fibres.

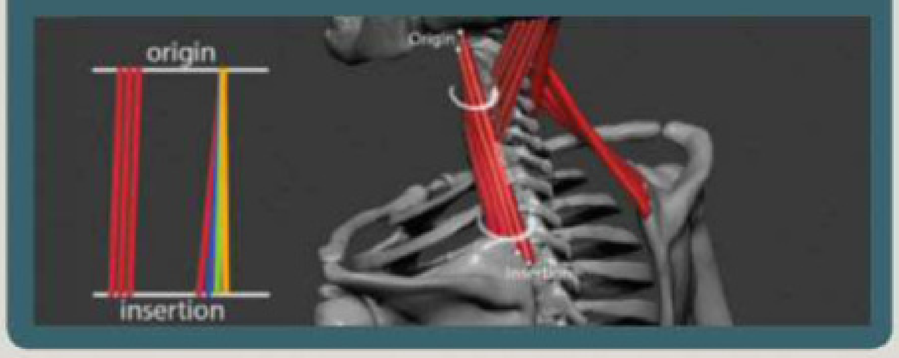
12 Fix and merge meshes

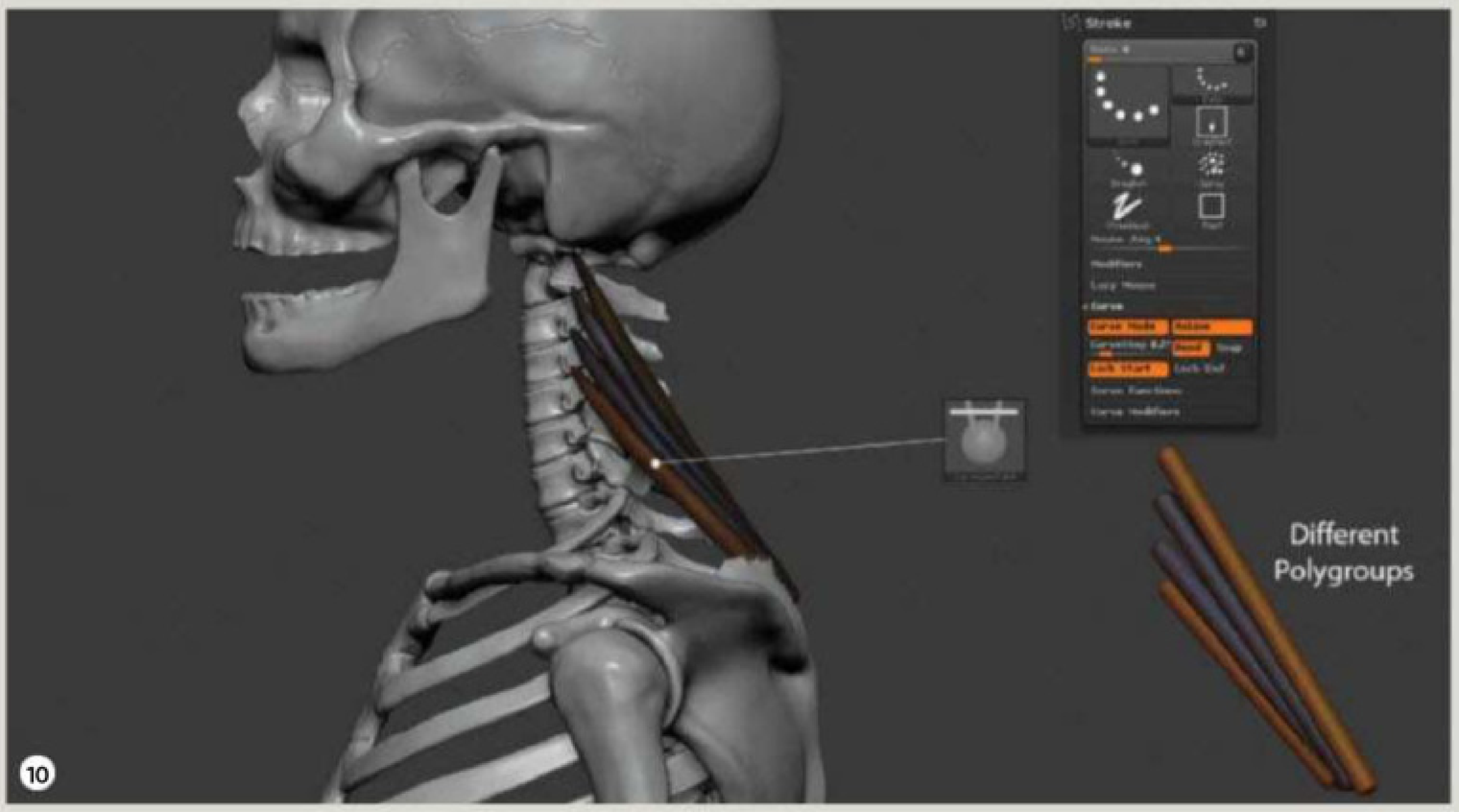
In the final step we need to focus on how the muscles are connected, both between them and with the bones. Merge the SubTool of the muscles with the SubTool of the skull so that we can draw lines overlapping them over the mesh. If we draw lines in separated SubTools but overlapped, we will notice that the drawn lines are broken. Merge the SubTools by going to Tools>SubTool and clicking on Merge Down. Try to position the SubTools together. Now using TrimDynamic we can blend the joint between the separated SubTools. After that we can follow the same process as in the previous step.

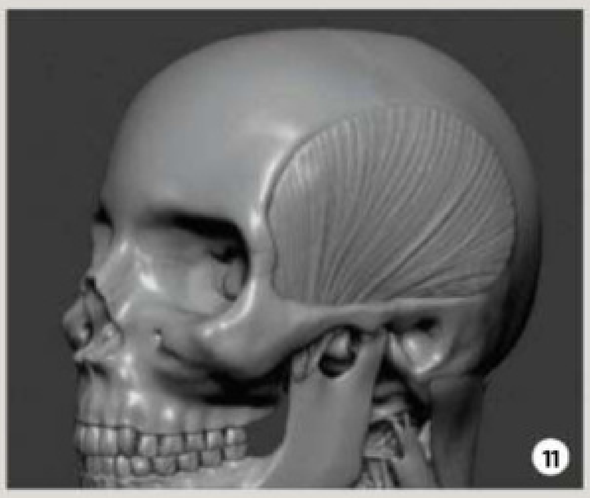


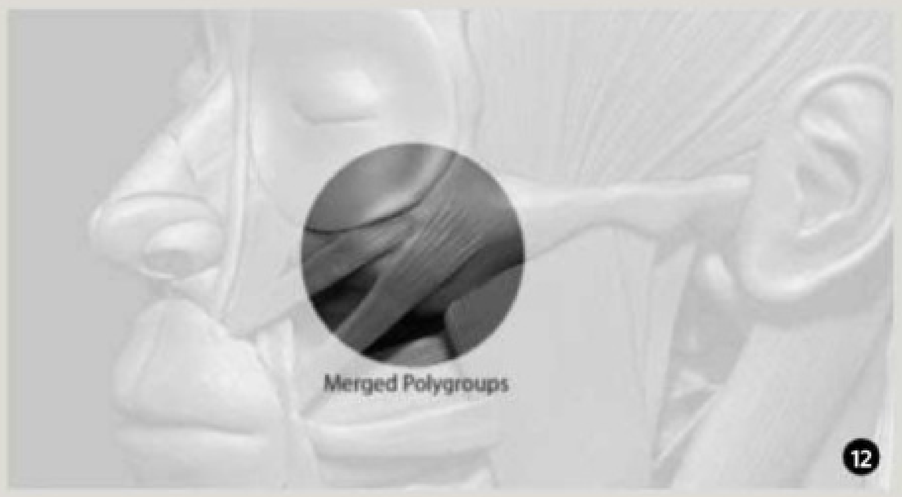
Consider the neck muscles

The neck is one of the most important areas to consider when we're creating the muscles. By understanding the anatomy of these muscles, we can see how they are connected with each other and with the bone. This is known as the origin and insertion of the muscles. The anatomy of these muscles is tense and straight, as you can see here, so one muscular fibre near another will create one muscle. This muscle's anatomy is created with several muscular fibres placed together, creating a rotation in the structure of the complete muscle.









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Back to basics

In the last chapter of our undersea odyssey, Jahirul Amin covers animation of a cuttlefish

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Animate a cuttlefish in Maya

"To conclude this Maya series, let's take a look at referencing, animating our cuttlefish and caching out the geometry"

In this final part of our cuttlefish series, we will focus on animation and take our fishy friend out for a bite to eat. Because our animation will be a standalone as opposed to part of a larger narrative, we have the luxury of being able to keep our work loose, making changes as we go to keep things going in the direction we're after.

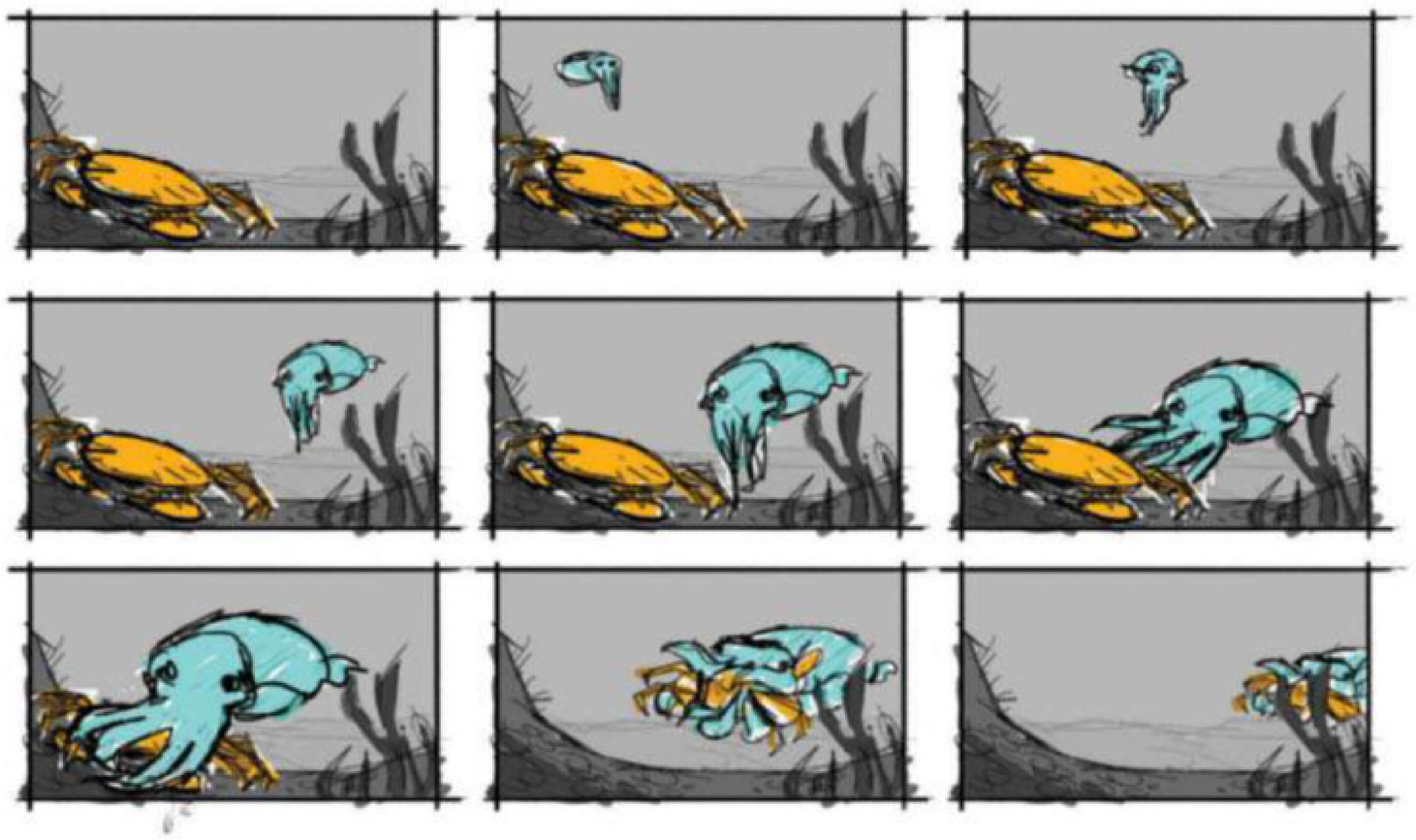
Though our cuttlefish may not outwardly seem the brightest button in the box, make no mistake, it is an extremely clever and quick killer and there's plenty of material online for you to access to see this water-dwelling fiend in action. As you will see, cuttlefish do love a nice spot of crab and can catch and demolish one in seconds, enabling us to make full use of the rig we created in the last tutorial.

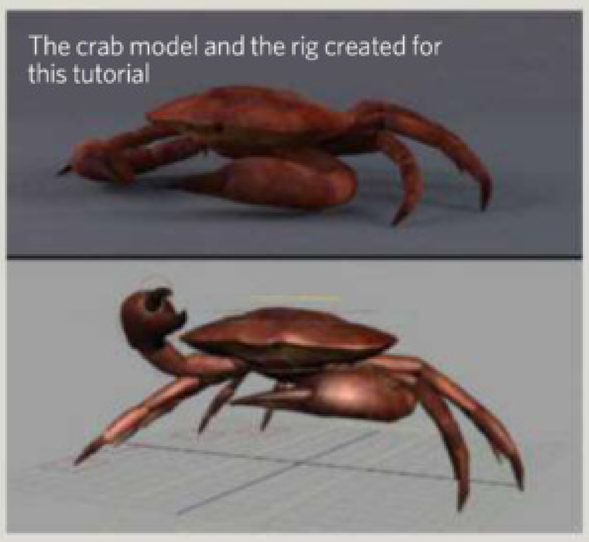
For this tutorial, I've knocked up a quick crab model with a rig for the cuttlefish to get its beak into. I've done a video demonstration of the rig so you can familiarise yourself with it before you start animating. I've also added a couple of blend shapes to control the opening and the closing of the siphon hole on the cuttlefish rig, which is again demonstrated in the accompanying videos.

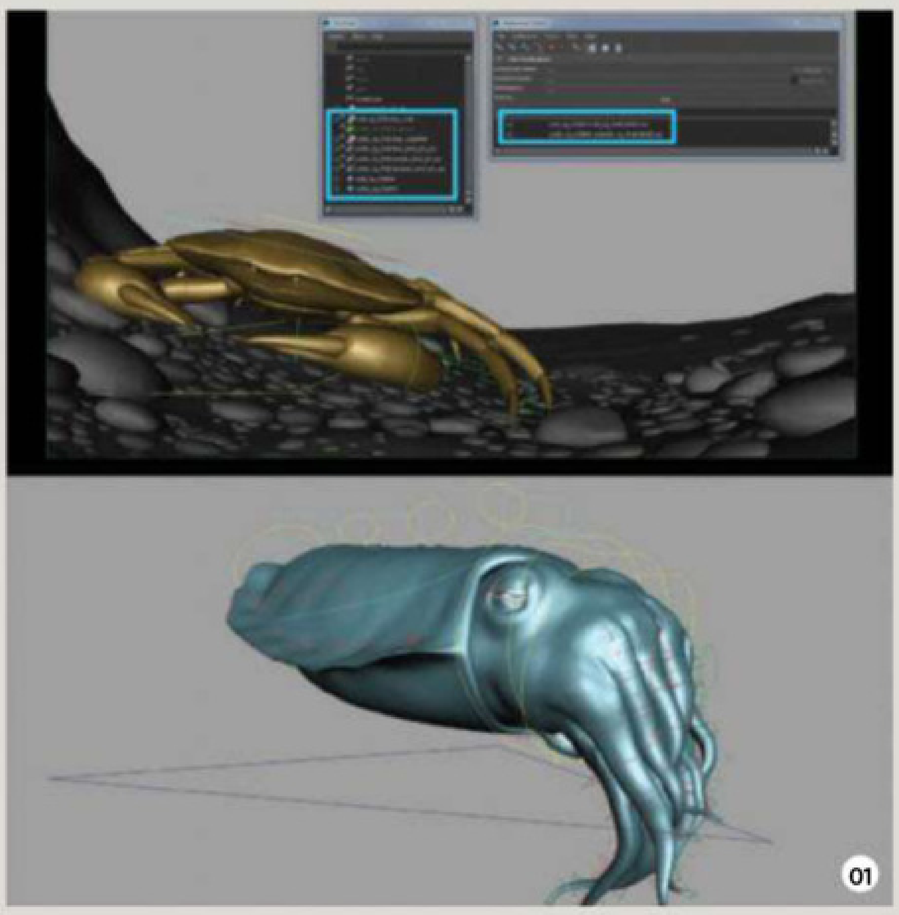
I've already set up a small environment along with a camera that has been locked off. Having a locked-off camera means we only need to work the poses from the camera's point of view, and therefore you don't have to make the poses look perfect from every angle. The animation start file and the final environment file (with moving grass, particular water matter and lights), both have the same camera so we can easily transfer the animation over from one file to the other.

In this tutorial, we will take advantage of referencing to keep our animation scene files light and also to give us the opportunity to make any changes to the rig should we need to, without losing any of our animation work. Different to Import, which brings in a scene file or an object, referencing simply points to a scene file, so any changes made to the referenced file will be updated to the file that's referenced it in.

Once we've completed our animation, we'll also look at Geometry Caching to transfer our animation to the final environment, ready for rendering. As the name suggests, Geometry Caching will allow us to bake the animation onto the

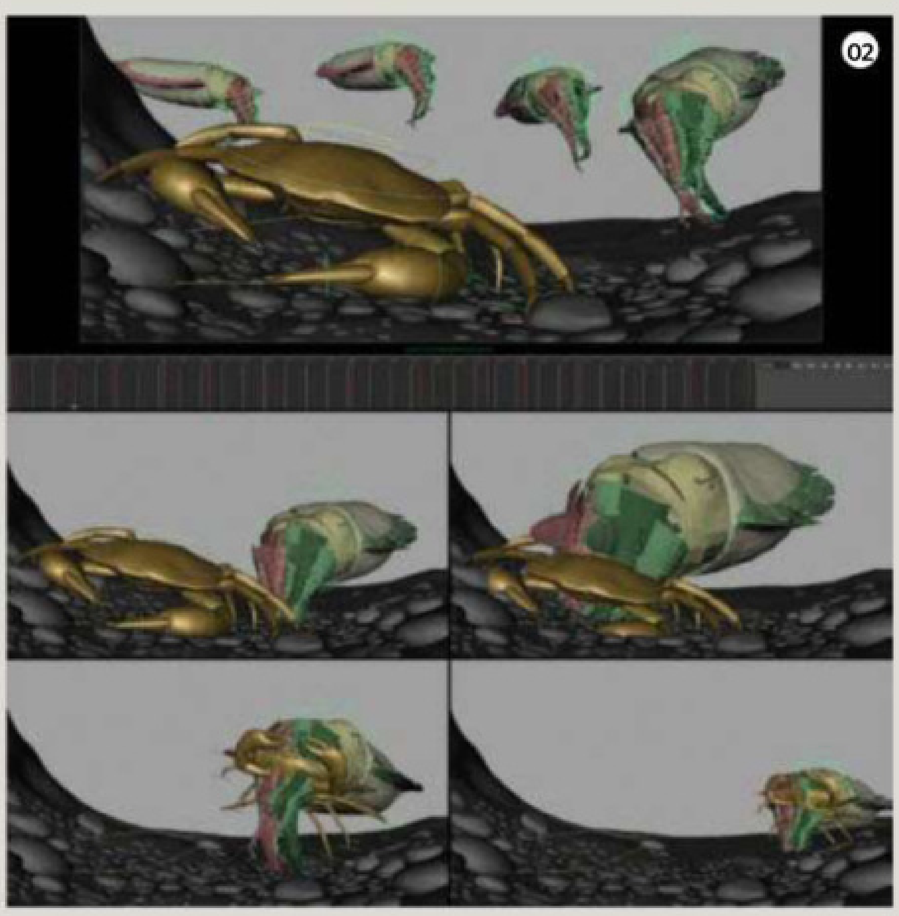






models and as a result, we will not need to take the rigs into the final environment. Again, this is to make our scene files small and therefore light.

Before we start animating, here are a few notes and some things to check. First, make sure to check your Animation preferences (Window>Settings/ Preferences>Preferences). Under the Settings menu, set the Time to Film (24 fps). Then go to the Animation menu and set the Default Out Tangent to Stepped. Next, go to the Time Slider menu and set the Playback Speed to Play every frame and the Max Playback Speed to Real-time [24 fps]. We need these settings for the dynamics to play through. For a character that has no dynamic elements, I usually set the Playback Speed to Real-Time [24 fps]. I've also enabled Auto Keyframe (the key icon under the playback controls), as I tend to forget to press the S key to set my poses. This can sometimes be a dangerous method as you may accidentally set keys when experimenting so if you do enable this, take care. Last, I've changed the Rotate Order for the main_ctrl on the cuttlefish to reduce the effects of Gimbal Lock (two axes sitting one on top of the other). Do this before you start animating by selecting main_ctrl and in the Attribute Editor, set the Rotate Order to ZXY or XZY.



Tentacles at the ready...

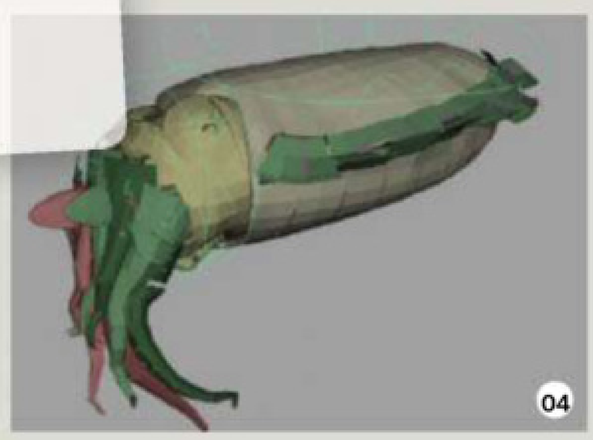
01 Reference the rigs

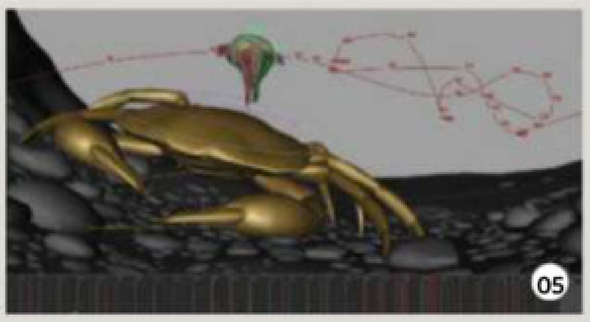
Start by opening up the scene file 01_animStart.ma, which you will find in the folder 04_animation_wip. This consists of the majority of the environment that our creatures interact with and also the camera that we will be animating to (renderCam). Let's now reference in the crab and the cuttlefish rigs. Go File>Create Reference (Options) and select Use Selected Namespace as parent and add a new namespace string: crab_rig_PUB. Hit the Reference button and in the 02_crab_rig folder, you will find crab_rig_PUBLISHED.ma. If you pop into the Outliner, you'll notice some blue diamonds around the asset that we just bought in, indicating that this is a referenced asset. Repeat the step for the cuttlefish rig, but make sure to give it a namespace string of cf_rig_PUB in the Create Reference options box. You'll find the cuttlefish rig (cuttlefish_rig_PUBLISHED.ma) in the 01_cuttlefish_rig folder. With both of the rigs referenced into the scene file, use the global_SRT control for each rig to position the creatures into their starting positions. Once we've positioned our creatures in the start positions, we will be no longer use the global_SRT controls.

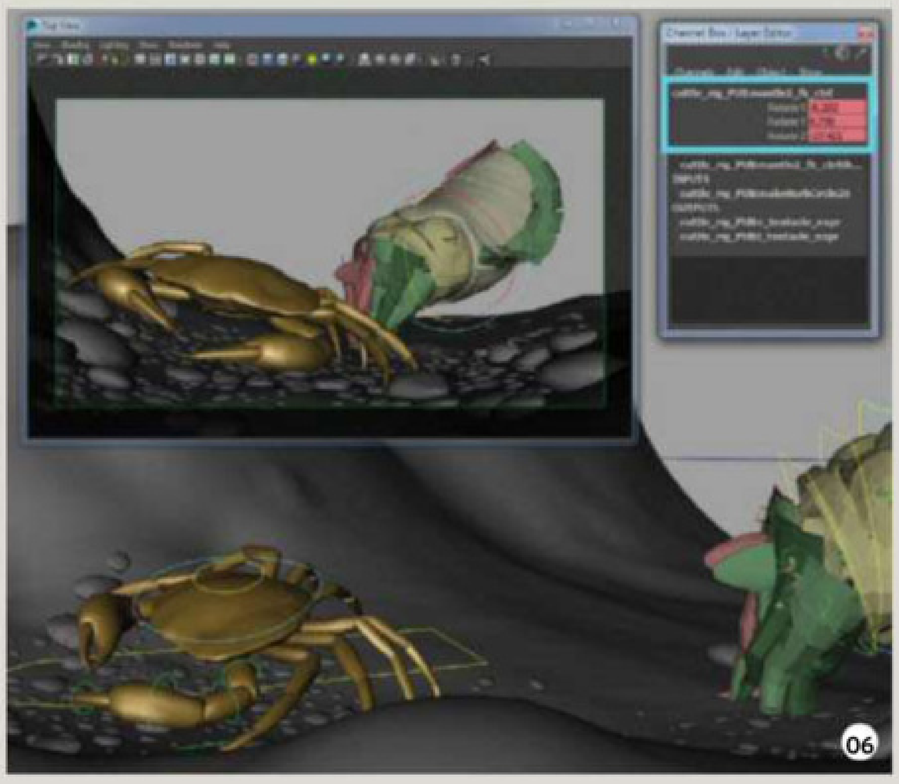
02 Block out the main poses

With the creatures in place, the first thing to do is loosen them up from their rigid default poses. With the crab, make sure his legs are on the surface and not penetrating any of the nearby rocks. For the cuttlefish, use a combination of the FK and the IK controls to have its arms pointing downwards and to add individual curl to each arm. At this stage, I left the two tentacles as they were. You can also loosen up the mantle by using the FK mantle controls. With the creatures ready to go, use only the main_ctrl for the cuttlefish to block out the initial poses and the carapace_main_ctrl to block out the poses of the crab. To have the legs of the crab follow the cuttlefish as it gets pulled back, switch the Follow World Carapace from world to carapace over a single frame. At this stage, don't worry about the timing and just lay out each pose one frame after the other. This allows you to get a good idea of how the overall piece would play out and to establish if the idea was readable without getting bogged down with the timing.

Back to basics







03 Continue blocking and retiming

After the main beats of the animation are in place, use a combination of the Graph Editor (Windows>Animation Editors) and the Timeline to start shifting the keys around to get a sense of the timing. To do so, keep some video reference playing back on your second monitor and adjust the position of the keys. I went through a period of trial and error through Playblasting to see what worked well and what didn't. As this shot isn't sitting between any other shots, we have the freedom to experiment with the timing. At this point, as well as trying to get a better sense of the timing, introduce a few additional poses to get a better feel for the path the cuttlefish moves in and to help convey the weight of the cuttlefish.

04 From Stepped to Spline

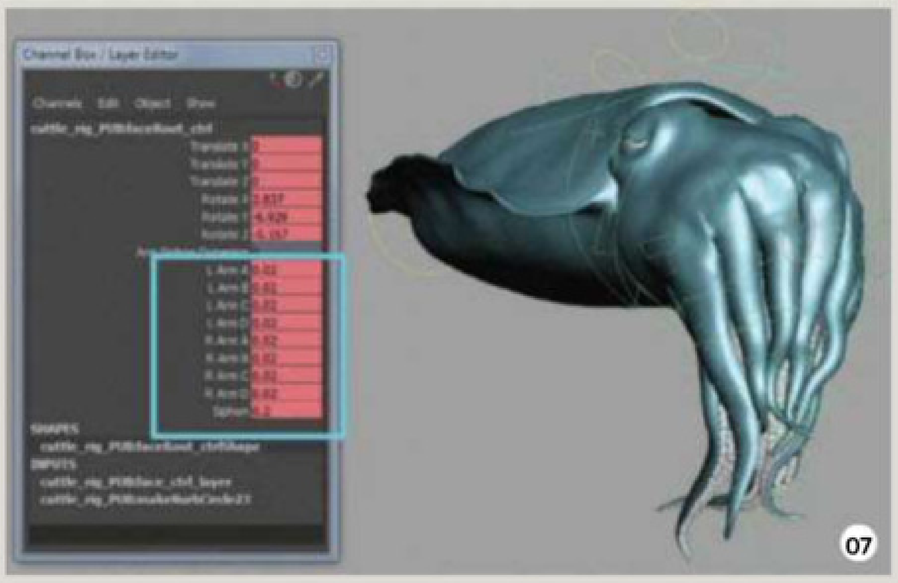
Once the basic idea and timing is laid out, convert the Stepped curves to Spline by going into the Graph Editor with main_ctrl selected, highlighting all the animation curves and going to Tangents>Spline (or Auto if you prefer). Open up the Animation preferences and make sure the Default in and Default out tangents are set to Auto. This means that any new keys added will no longer be created with a Stepped tangent. At this stage, focus on the timing, as going from Stepped to Spline can sometimes make the animation feel faster than you would like. I ended up extending the animation again to slow down the cuttlefish as he comes into screen and approaches the crab. Rather than the cuttlefish coming straight for the crab, add a slight moving hold towards his early appearance in the shot to help break up the rhythm of his movement. It could be good to give the impression that the eyes of the cuttlefish are locked on its prey, so rotate the main_ctrl to help support this.

05 Use Editable Motion Trail

With the timing and the path of the motion laid out, start tidying the overall movement. To help smooth the motion as it transitions from screen left to screen right, take advantage of the Editable Motion Trail tool. Select the main_ctrl and go to Animate> Create Editable Motion Trail. You can now grab the keys directly on the trail and adjust them to improve the movement. You can also hold down the Ctrl/RMB over a key on the motion trail and reveal the In and Out tangents to help refine how the cuttlefish approaches each of the keys and takes off again. It can be done with the Graph Editor, but with the cuttlefish moving on three different axes, it's not recommended. Add some keys to get the fins moving. This is mainly to loosen him up and to get a feel for how everything will work together. For l_autoFin_ctrl and r_autoFin_ctrl, set the Swim Speed to 100 at frame 1. Around frame 170, set the Swim Speed to 150. Around frame 400, set it to 250 and on the final frame, set it to 400. Use the Offset attribute for each fin to create the sin-like wave motion. To establish this, set Fin B Offset to -1, Fin C Offset to -2, Fin C Offset to -3 and so on. Experiment to see what works, as we can change things later on.

06 Animate the mantle

Once the main motion of the cuttlefish is in place, add some further movement to the mantle. If you look at some reference of cuttlefish swimming, you'll probably notice that the mantle stays pretty stable. In my own animation, I decided to exaggerate the movement. If you want to do this, push some of the poses to make for a more interesting silhouette. To animate the mantle, stick with the FK controls to begin with. If you want to push the poses further later on, you can always use the IK controls to enhance them.



Playblast and take a step back

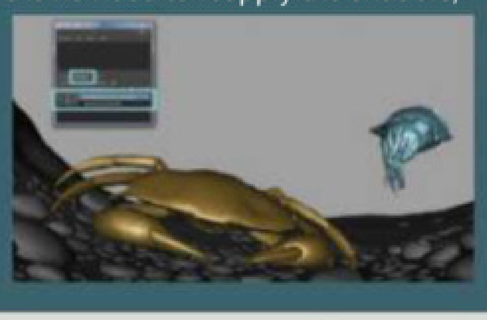
The rigs we're using are pretty heavy, especially the cuttlefish with the dynamic arms active. Therefore it is hugely important to make sure that throughout the animation process you create Playblasts of your work to get a clear vision of what your scene actually moves like. To create a Playblast, hold the Ctrl/RMB over the Timeline and go Playblast (Options). Set the Format to Image and the Encoding to JPEG. If you want to compare one Playblast to another, enable Save To File. You can load a previously saved one into Maya's FCheck by going File>View Sequence and selecting the first frame in the sequence. While viewing your Playblast, take a step back from the screen every now and then to get a different perspective on the animation.

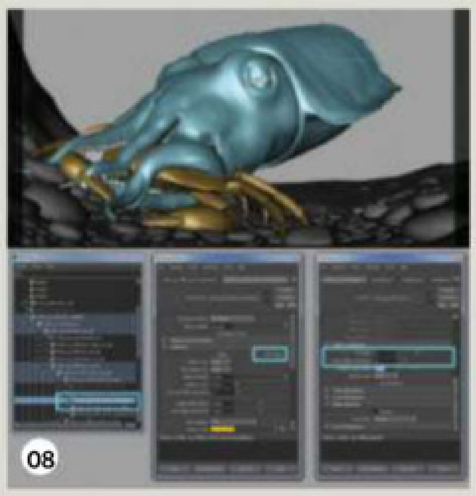
07 Add the dynamic arms

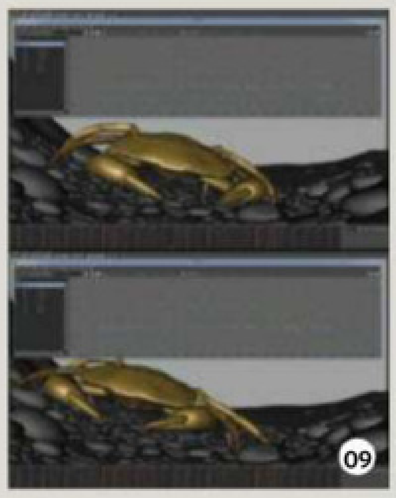
Let's focus on the arms. Make visible the lowResArms_dyn_geo_ layer and create a Playblast. With the default setting we get a lot of movement, but the arms aren't interacting with the crab or the environment. To fix this, pick the foreground_geo, the crab_geo and some rocks around the crab. Don't select everything in the scene, as this will affect the playback speed. With those objects selected, in the nDynamics menu go nMesh>Create Passive Collider. Create another Playblast to view the results. Start reducing the influence that the dynamics have over the arms. You can do this by upping the value of the additional attributes that we added to the faceRoot_ctrl in the last tutorial. Set keys on these attributes to decrease, then increase the effect of the dynamics in the arms.

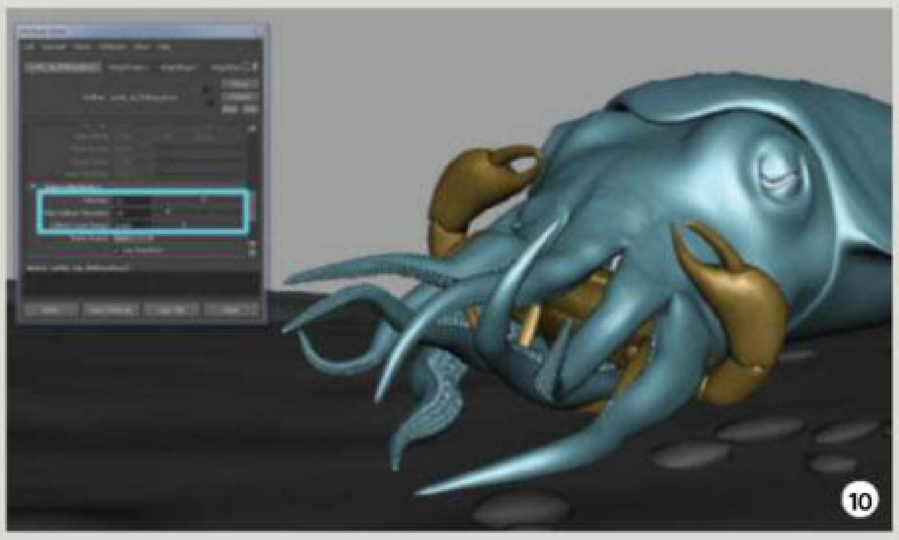
Use Render layers

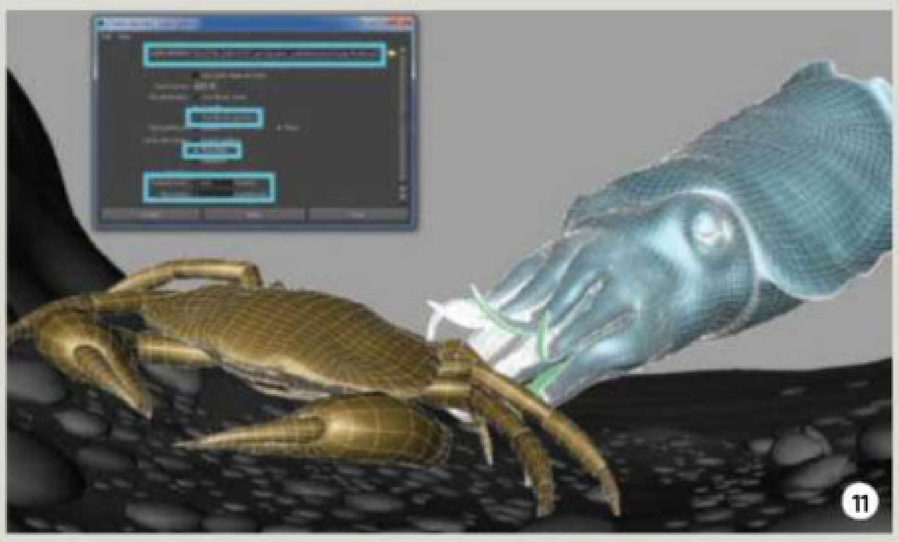
As we've set up the creatures using the mental ray shaders, in the Viewport, we mainly see them represented as flat black materials. We could give the objects new shaders and then reapply the final shaders for rendering, but what I like to do is use Render layers. This way, I can apply new shaders onto the assets, work on this layer and then delete it later on to go back to the default shaders. There is no need to reapply the shaders, we just need to switch layers. In the Layer Editor, switch to the Render tab, hold down Ctrl/RMB over masterLayer and go Copy Layer. Add new Blinn or Lambert shaders and colour them how you like.

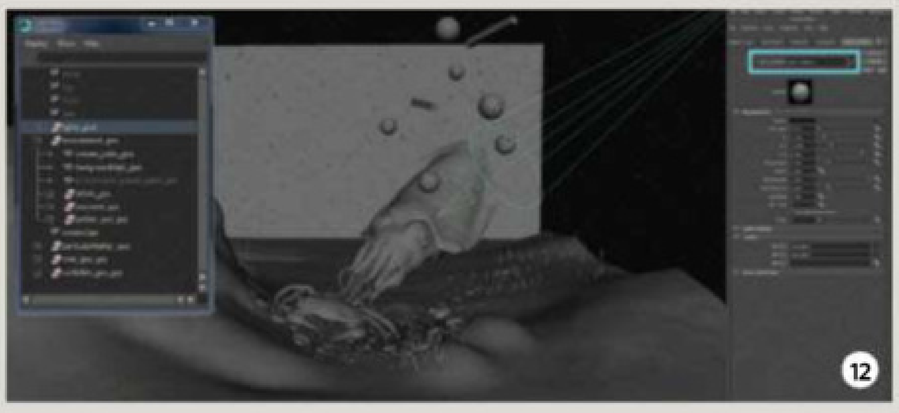












08 Add Self-Collisions on the arms

Once happy with how things are moving, we want to have the arms collide with each other and to increase the quality of the dynamics to reduce the degree to which they penetrate other objects. To have the arms self-collide, select one of the hair systems for an arm, which you will find under the arm_rig_grp and enable Self-Collide in the Collisions tab on the hairSystemShape node. Make sure to do the same for all eight arms. Next, select the nucleus1 node and increase the Substeps to 8 and the Max Collision Iterations to 12 under the Solver Attributes tab. Again, a lot of Playblasts will need to be created and small iterations will made to control the behaviour of the arms using a combination of the FK and the IK arm controls.

09 Animate the crab

Let's move on to the crab. As I wanted to keep the moment when the cuttlefish grabs the crab intact, I decided to first animate the crab from that point until the end of the animation, and then work on the beginning of the animation up to the point of attack. From the attack onwards, focus on getting the legs to feel as if they are being dragged quickly as the cuttlefish pulls back. Tuck the majority of the legs in so they don't penetrate the arms while keeping some out on display to add visual interest. I also added small movements to the arms and the pincers to make sure the crab had a little fight left in him. It's then time to animate the early portion of the crab motion up until the attack. As we want the main focus to be on the cuttlefish, let's keep the movements of the crab small and subtle. A few steps to the left, a look here and there and a few steps back are all that are required. In contrast to the fluid movement of the cuttlefish, we want the motion of the crab to feel a little twitchier.

10 Refine the interaction

With the bulk of the crab taken care of, the next step is to tidy up the interaction between the two creatures. In Playblasts, the arms of the cuttlefish may seem to be going a bit crazy as they first grab the crab. To help address this, make sure the arms are not penetrating the floor by using the FK arm controls. The IK controls on the arms are particularly handy to make small adjustments and better wrap the arms around the crab. Create more Playblasts until you're satisfied with the effects created by the dynamic arms and the input from the FK and IK arm controls to wrap the arms around the crab. If you're finding that there are small twitches or blips on the tentacles, increase the Substeps and Max Collision Iterations on the nucleus1 node.

11 Geometry Caching the animation

Once you're happy with the animation, let's prepare it in order to take it into the scene file that we intend to render it out in. As we currently have the cuttlefish colliding with the ground, the crab and many rocks, we'd need to take pretty much everything from this scene file into the render scene file. I'm not interested in taking everything and I want to keep my assets as light as possible when lighting. So to keep things light, we will use Geometry Caching to bake out the animation onto the models. Select all the skinned elements of the cuttlefish and the crab, and in the Animation menu set, go to Geometry Cache>Create New Cache (Options). Create a new folder for the cache (for example: finalAnim) and set the File Distribution to One File Per Geometry. With everything else as it is, hit Create. Once this caches out, open up the scene file cuttlefish_mod_PUBLISHED.ma in the 05_models directory. This scene file consists only of the geometry of the cuttlefish with the shaders attached. Pop into the Outliner and examine this file and you will notice that there is no rig for this asset. Select mantle_bind_geo and go Geometry Cache>Import Cache. From the finalAnim folder, select cuttle_rig_PUB_mantle_bind_geoShape.xml. This is the file that was cached out for the mantle from our final animation file. Once it has been loaded in, hit Play and you'll see the animation has been applied to the mantle geometry. Do the same for the face_bind_geo to see if that works.

12 Bring the animation into the final environment

Open up 02_renderScene.ma in the 03_environment directory. This file consists of the environment with animated grass and debris, particular water matter and lights that are casting rays through a parti_volume node. Import both cuttlefish_mod_PUBLISHED.ma and crab_mod_PUBLISHED.ma from the 05_models directory into this scene file. One object at a time, add the relevant Geometry Cache file to each model to apply the animation. Once complete, create a final Playblast to check that everything has come through successfully, rework the lighting to suit your needs and render out. That brings us to the end of this series. I hope it has been informative and enjoyable – now go and treat yourself to some fish and chips.

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Build a forest with XGen and Arnold

How can I create complex scenes with XGen and Arnold?

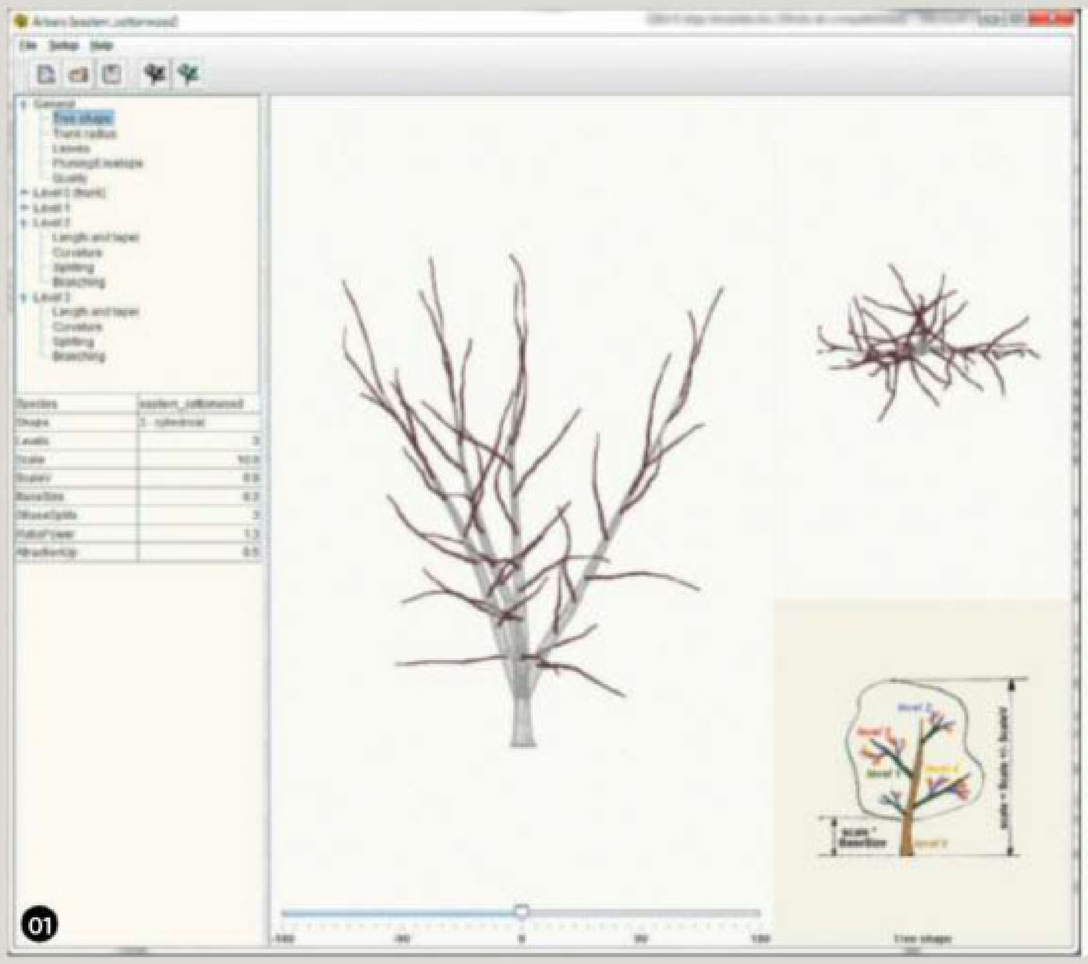
With the most recent versions of Maya, XGen – the Arbitrary Primitive Generator created by Walt Disney and Pixar – has been included. This enables you to create massive procedural geometry at render time, from splines and spheres to custom geometry. The Maya to Arnold (MtoA) plug-in from Solid Angle now supports XGen, allowing for the creation of scenes with huge amounts of geometry.

As these features are relatively new, it can be tricky to find documentation about how to use XGen with Arnold and take advantage of these technologies. In this tutorial, I will use a simple example to show how to start using XGen with custom geometry to achieve a procedural forest very quickly.

We will discuss how to create procedural trees with a high number of polygons using the Arbaro open-source program. We will then convert these to the archive format that XGen is able to use for its custom geometries. The MtoA plug-in should be loaded so that Arnold will be able to use these archives.

After that, we will learn how to create an XGen Description on a surface that will use our previously generated archives and will distribute them in a random, but controlled way over our terrain. After that, we'll light the scene in a basic way to add some drama, which will reveal the size and scope of the forest. Last, we'll edit the tree shaders to give a better result.

I hope this tutorial feeds your interest in XGen and Arnold and that it will inspire you to make new things using this base knowledge. This is only a part of the huge range of abilities that XGen will allow in combination with Arnold. The more you learn about XGen, the more you will find new applications for this creative tool.



01

growing community at www.3dartistonline.com

iClone

John C Martin II

www.reallusion.com

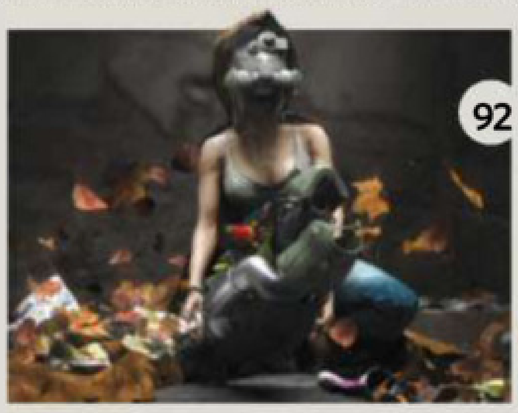
John lives in Kentucky, USA and is vice president at Reallusion. This issue he takes a look at how you can use Autodesk software and iClone to quickly create an animated character

Photoshop

Andy Jones

www.andyjonescreative.com

Andy currently works as a senior CG artist at Mullen Advertising. Starting on p90 he reveals how Photoshop postproduction techniques can transform a raw render



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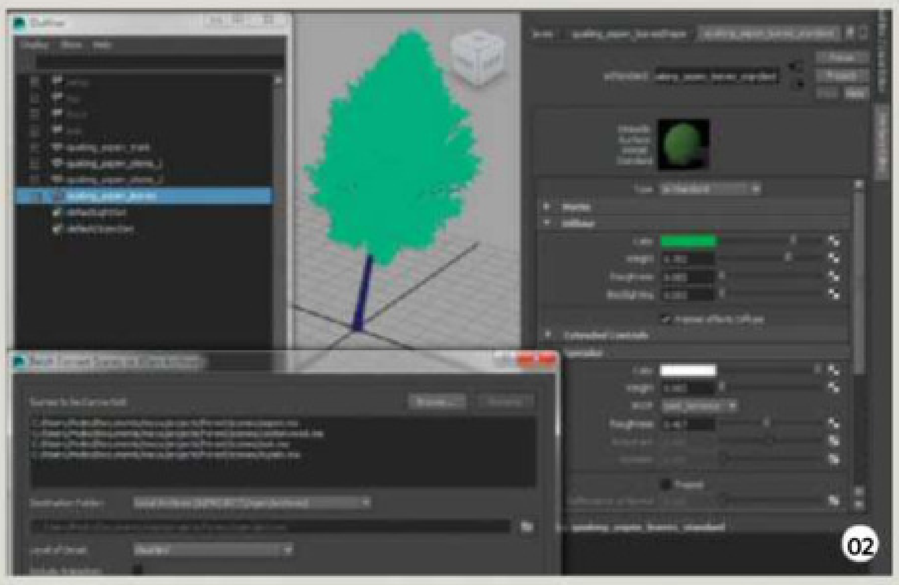

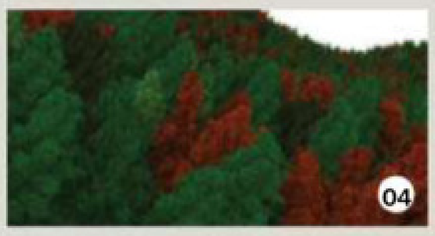

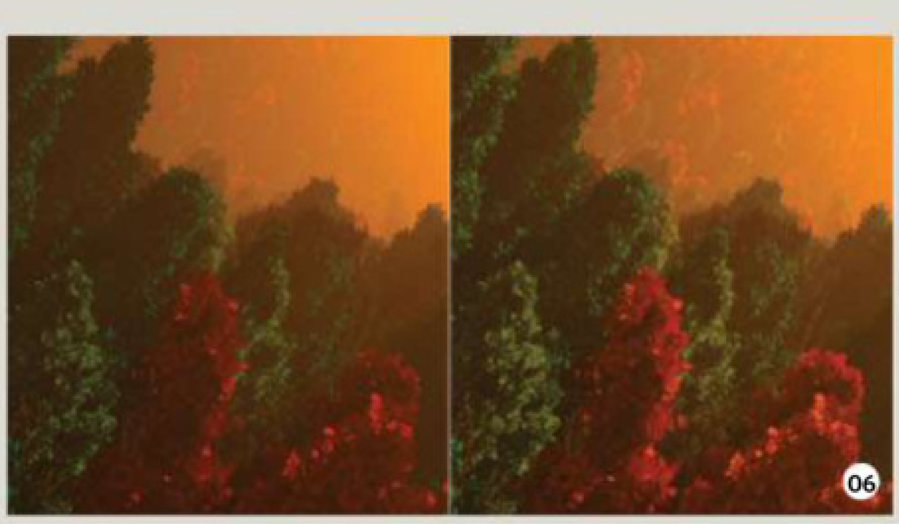

Preview/Output settings

When dealing with lots of geometry, your computer can sometimes freeze. This can be prevented. In the Preview/Output tab of the XGen window, there's a Percentage attribute in the Preview Setting and one in the Output Settings. With this you can show less geometry in your viewport, even though all of the geometry is visible in the render. You can also temporarily reduce the amount of geometry you render.

01 Build the trees

To create the trees you can use Arbaro, an open-source software that you can get from http://sourceforge.net/projects/arbaro. Create four different trees based on the Arbaro presets, such as a quaking aspen, a cottonwood, an oak and a tupelo. These are a good choice as they are very different and will give a nice variation to the final render. To give them a similar size and to add detail to the leaves, change their values in Arbaro. For the oak tree, set the Scale to 9 and the ScaleV to 0. For both the aspen and cottonwood trees, set the Scale to 10, the ScaleV to 0 and the LeavesShape to disc9. Last of all, set the tupelo's Scale to 12, ScaleV to 0 and LeavesShape to disc9. Export these four trees to an OBJ file with the Smooth value set to 1.

02 Create the archives

In order to use the trees in XGen, we'll need to create XGen archives that contain the models. In a new Maya scene, import one of the tree OBJ files with the Use Namespaces option disabled. You will get some groups with different parts of the tree. Assign an Arnold Standard Shader to each group and be sure to give it a descriptive name. For example, assign the black_tupelo_trunk_standard shader to the black_tupelo_trunk group. Save the Maya scene when you finish with it and do the same with the remaining trees. Then go to XGen>Batch Convert Scenes to Archives. Select these files and convert them.

03 Add XGen to a surface

Create a surface that will be used as a terrain. Open the XGen window and create a new description, then select the Custom Geometry/Archives option. In the Archive Files section of the XGen window, add one of the created archive trees and accept the dialog asking about adding the archive materials. They will probably appear bigger than you expected, so adjust the Size slider until they reach an appropriate size. Add the other three tree archives and render them to see how they look. You may want to adjust the Density attribute in the Generator Attributes section until you reach the desired appearance.

04 Randomise the distribution

As you can see, every tree is in the same position and there is the same number of each kind of tree. We can write some expressions to add more variety to the forest. Let's move to the Primitive Attributes section in the XGen window. We'll change the number of each tree type by editing the Index Attribute to pick (rand(),0,$aCount-1, 0.2,0.15,0.25,0.4). This expression will make a distribution of trees following a 20% of first index trees, 15% of the second, 25% of the third and 40% of the last one. Other useful attributes to edit could be setting Length to rand(0.9,1.5), Tilt U to rand(-0.1, 0.1), Tilt V to rand(-0.1, 0.1) and Twist to rand(-180, 180).

05 Light the scene

Now we will light the scene with a very simple setup. Create an Arnold Skydome light by going to Arnold>Lights>Skydome Light and connect an aiPhysicalSky shader to its Color. In order to be able to see the aiPhysicalSky in the background, you must connect it to Background in the Environment section within the Arnold Render Settings window. Place the Sun in the position you prefer. If you want to add some volumetrics to the scene, you will have to add a spot light that will be oriented in the same direction as the Sun from the aiPhysicalSky. Then, connect an aiVolumeScattering to the Atmosphere attribute in the Environment section. In the IPR render you can play with the spot light and Physical Sky Color and Intensity, as well as the Volume Scattering Color, Density and Anisotropy to get the aspect that you want.

06 Shade the trees

Last of all, let's change the shaders of the trees so they look more realistic. When we added the archives, their shaders were automatically loaded in the Maya Hypershade, so you can modify them in the scene and you won't need to re-create the archives. Find the shaders for the leaves and add a small amount of Specular component and backlighting. You can make these changes while rendering with the IPR and have immediate feedback within the render.

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- Textures
- IBL spheres

ESTIMATED TIME TO COMPLETE THE TUTORIAL
2 HOURS

A final render made with textures taken using a camera phone

Photoshop/Photosynth

Create textures using your iPhone

What's a quick and easy way to build up a texture library?

One of the best ways to build up a texture library is to capture assets on the go. By snapping up textures as you find them, you can use them to add authenticity to a project by using contextually correct assets.

To do this, you should always be on the lookout for interesting textures – you'd be surprised at how much you can find just by walking down the street. Whenever I'm out I always photograph anything that could be used as either reference material or as a texture. Collecting images in this way means that I have a constantly expanding set of images that could come in useful for future projects.

Ideally you want the best resolution you can get from the initial capture as this gives you more options when it comes to creating the final files. With digital cameras the amount of megapixels (MP) indicates the image size, but another important consideration is sensor size. Generally speaking, a 10MP photograph captured by a camera with a full-frame sensor will be of much higher quality that one captured by an APS-C or APS-H camera. There are other factors such as noise, sharpening and dynamic range to take into account when it comes to ultimate image quality.

Quality comes at a cost though, with models such as the Canon EOS 5D III priced at £2,999 / $3,399 for the body alone and, in many cases, I question whether the huge resolution is necessary. Most textures you use in a scene don't need to be shot at 21MP to get good results. Indeed, if you were to use huge textures throughout a scene, render times would quickly spiral out of control.

Personally I think the best camera for grabbing textures quickly and easily is the one you already own and carry around with you all the time – the camera phone.

There are many advantages to this approach: it's free, simple, quick, there's no bulky camera bag or tripod to haul around everywhere. It lends itself perfectly to the spontaneous nature of grabbing images whenever and wherever you see them. Another bonus is that taking snaps on your phone is pretty inconspicuous so you can use it in situations where you wouldn't get away with using a full camera kit.

There are some practical considerations to using your phone for texture photography as well as a few tricks to get more than you would expect out of it, so let's get started.

01

01 Watch the light

First, let's cover a basic point for shooting textures – light. You should always try to shoot in diffuse lighting conditions, because bright, directional light is the enemy, casting shadows on (or from if it is a bumpy texture) the subject and blowing colours out. If you are fortunate enough to live in the UK, you have an almost constant supply of cloud cover that makes an excellent diffuser. On the other hand, if you're unlucky enough to live in a sunnier climate, you may have to resort to shooting in shaded areas or using a foldable diffuser to break up the light.

Know what to expect

It goes without saying that getting textures that will bear close scrutiny in ultra-high res renders is not possible. However, you will get images that are fine at anything up to medium-close distance. An iPhone 4S (which is what I use) will give you an image resolution of 3264 x 2448px and there are quite a few Android phones with much higher MP counts. As mentioned earlier, the small sensor of a camera phone will not get the results you would expect from even a modest DSLR. However, resolution isn't everything and camera phones more than make up for this in versatility, simplicity and portability.

02 Quirks of camera phones

If you open up the camera app on your phone you will notice little in the way of controls, but make sure the flash and HDR options are off. The main thing you need to be wary of is focus, as it tends to jump in and out. The best way to manage that is to tap the subject on your screen before taking the photo. There are other apps available that give you more manual controls such as Camera+ (£1.49 / $1.99 on the App store). This app gives you access to independent exposure control, image stabilisation and a few other goodies. Whatever app you use, make sure that there are no filters or colour effects applied. You want the image in its purest form and any colour corrections can be made afterwards in Photoshop.

03 Remember the location

One of the best things about using your phone for texture photography is that since it's so quick and easy, if you mess some images up or if they don't turn out right, it doesn't really matter. However, if there is an image you really want to perfect, or if you need a high-res shot with a full camera setup, your phone automatically points you in the right direction. Every image you shoot on your phone is geotagged, so if you can't remember where you found that amazing texture, just check the info in the photos folder (in iOS 7, make sure your location services are on and tap the text above each photo collection to go to the map view). You can even get directions to head back there!

04 Push the boundaries

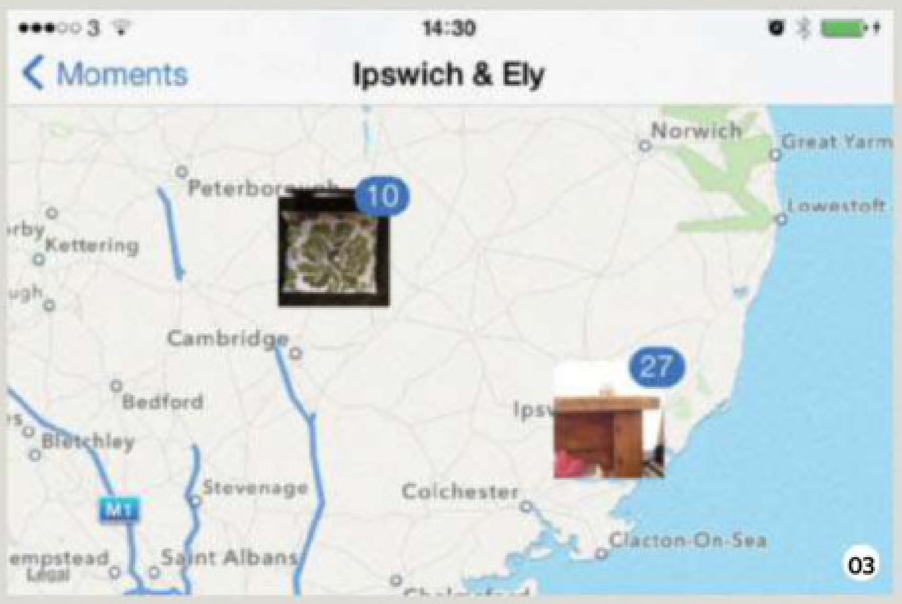
If you need to get larger images than normal a good option is the Panorama tool. With this you can shoot long strips in one go and get easy unwraps of cylindrical objects like trees. Try to keep the subject as close to the middle of the frame as possible as that will ensure any image repeats (little steps that appear when you wobble) won't ruin your shot. The main things to remember are to move slowly and to keep the guide arrow central. It will take a few practice runs to get right, but when you do, you can get images at over 10k wide from an 8MP camera.

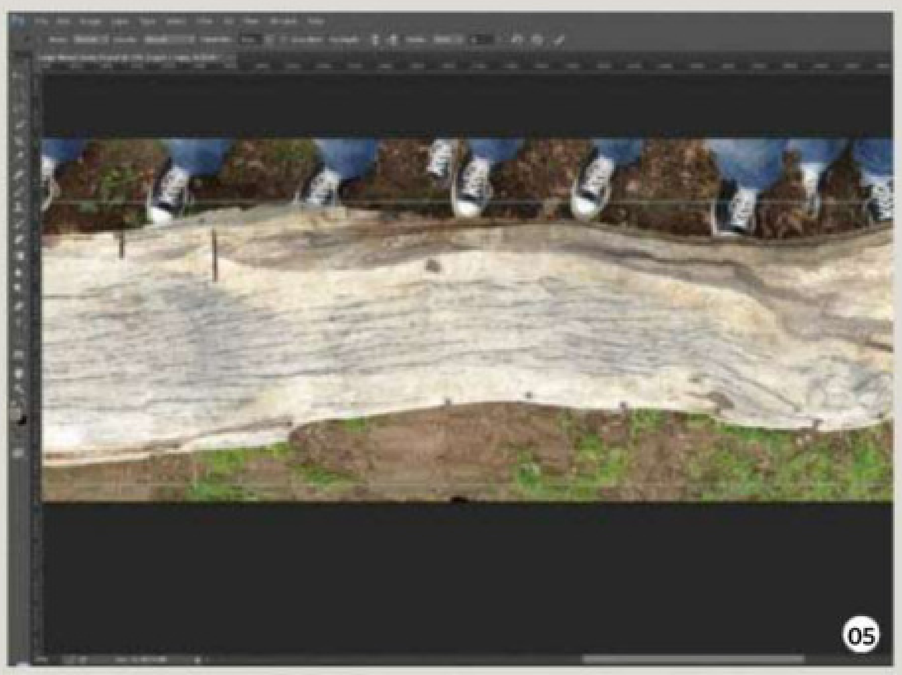
05 Fix the wobbles

The previous technique can be extremely effective, but unless you have an amazingly steady arm there will be wobbles on the final image. This is where Photoshop and the Puppet Warp tool come to the rescue. I find the best method is to set guides for where you want the edges to be then go to Edit>Puppet Warp and click on your image to start placing pins. Follow the wonky edges all the way around (if you find the pins are snapping to the guides, just switch them off for now so you can place the pins freely) and, once all your pins are placed, click on them and drag them all so that they conform to the guides. It can look like it's distorting horribly while you're doing this but don't be put off – work all the way around before you make a judgement as it tends to straighten out when all of the pins are on the guides. Once you're happy with it hit the tick in the toolbar and it will commit the changes. Use the Crop tool at this point and crop to the guides so you have clean edges if you want to make a tileable texture.

06 Easy IBL

HDR photography is a great way to capture lighting and reflection information for use in 3D. The kit can be pricey, but you can get similar results from LDR photography and you can do that with your phone. Photosynth is a free app that lets you take a series of shots and then stitches them together to create a spherical image. Make sure Exposure Lock is on as you want all of the image exposures to match. When you're ready to start shooting, aim for the brightest point first so that you expose for this – if you expose for anything else then the bright areas will be blown out in the final image, but if your foreground is too dark you can bring it back in Photoshop. The shooting process is intuitive and there's a visual guide to where your shots have covered. Ensure there are no gaps by overlapping. Once you have your panorama you can use it in your 3D software in the same way as an HDR. Keep in mind that if you want your image composited into the background of your scene you'll need to shoot some backplates as the sphere from Photosynth is way too low-res to use. If you get noise in your renders (which can be an issue when using low-res images for lighting) open the image in Photoshop and scale it up to a larger size, then blur it out and use it for lighting while keeping the original file for reflections.





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iClone character animation with Autodesk

How can I make a rigged character model and animate it with the iClone Animation Pipeline?

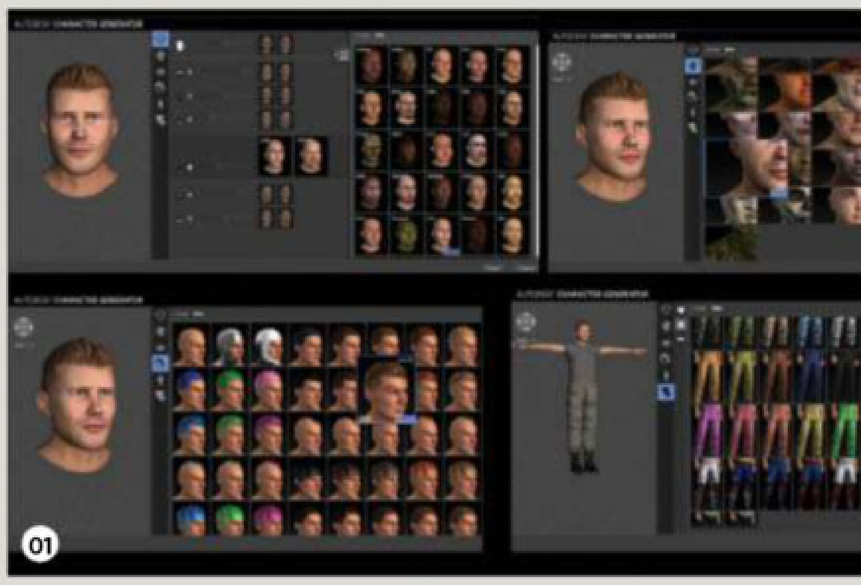
Whether it's for previsualisation or production, sometimes you need a speedier solution for character design and animation.

The combination of the Autodesk Character Generator and Reallusion's iClone Animation Pipeline is the perfect duo to quickly create a 3D character and bring it to life. Furthermore, the iClone Animation Pipeline goes full-circle and exports your animated characters back into Autodesk 3ds Max or Maya.

The process begins with generating a custom character, which we will use the web-based Autodesk Character Generator to achieve. These characters can be quickly customised, dressed and exported as an FBX file. Subscribers to Maya, Maya LT, 3ds Max, Mudbox or MotionBuilder have access to premium export features that add face bones or blend shapes. Exporting the FBX file from the Autodesk Character Generator costs five Cloud Credits per high-quality character export, which is about £3 or $5. While free exports are available for low-poly, they do not include the face bone or blend shape data, but are a good character source for crowds or anywhere that you only need a lower level of detail.

The iClone Animation Pipeline is designed to drastically reduce the time necessary to animate your custom characters. There is no need to script custom controls or slowly animate frame by frame with iClone as all the tools for face, body and lip-sync are ready to animate your character. Before the imported FBX characters are ready to animate, they need to be set up for use with iClone using 3DXchange. Part of the iClone Animation Pipeline series of tools, 3DXchange can import any FBX, 3DS, OBJ or SKP model. FBX files are loaded into 3DXchange with all the bones visible for retargeting to the integrated HumanIK inside iClone. HumanIK makes it possible to quickly associate your Autodesk character to the iClone animation system. 3DXchange is also where your custom character facial data is assigned to utilise the iClone facial-puppeteering and lip-sync mechanisms. Once the 3DXchange character setup is complete, you can begin animating in iClone.

iClone animation has lots of ready-to-animate options for breathing life into your character – face and body-motion puppeteering, 3D mo-cap files, keyposing and lip-sync are all included. Record your voice or import audio to make characters talk, then get instant access to every keyframe on the Liptrack timeline for precision editing. Create fast performances to accompany your voice with the library of mo-cap files or quickly build a motion with the Puppeteering tools. iClone also has traditional animation tools blended with HumanIK to make posing characters and keyframe editing intuitive and easy for animators, no matter what skill level. The Facial Puppet tools make use of all the facial bones and blend shapes your character includes to give animators a true hand on their performance. Once the animation is complete, the character and its animation is transferred back into 3DXchange where it can finally be exported as an FBX file to return to your production tool of choice.



01 Generate a character

Access the Autodesk Character Generator at http://charactergenerator.autodesk.com. It has over 100 body types, clothing and other distinguishing features to build your own custom 3D actor. Autodesk provides full use royalty-free of the generated actors in commercial or non-commercial projects, including games, apps and videos. Select two source characters to blend their appearance, then stylise the facial and body attributes to your liking. It's easy to achieve both human and creature character types. Feel free to dress your character however you like. When your design is complete, generate and download the character FBX.

02 Convert your character

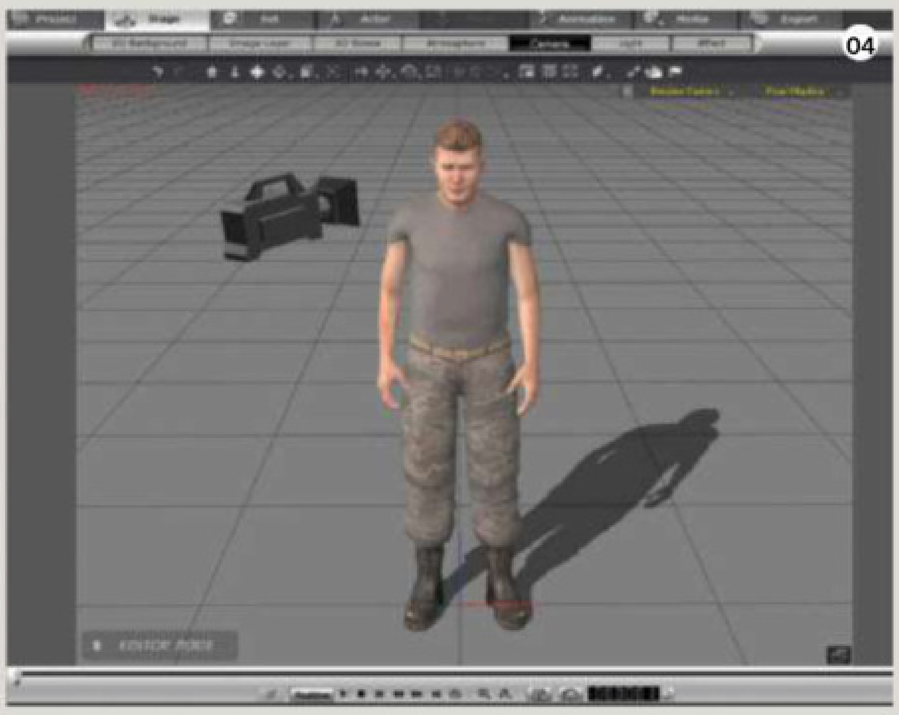
Autodesk FBX is loaded into 3DXchange where the conversion process prepares your actor for iClone. Once loaded, the FBX appears with bones visible so that they can be retargeted or easily selected. Select to convert the FBX file into a Non-Standard iClone character. Non-Standard means that the character originated somewhere other than iClone. In the dropdown menu on the right-hand side of 3DXchange, select the Maya HumanIK option to instantly retarget the FBX character bones to iClone. A green light will appear if this is successful. Finally, associate the face bones, eyes and jaw to prepare for the Expression Editor.

03 Set up the facial expressions

After you have converted the FBX file into a Non-Standard character, the next step is to open the 3DXchange Expression Editor and set up the face for puppeteering and lip-sync. This process steps you through head, jaw, eye, blinking, viseme and puppeteering setup. The head and eyes are easily updated, but the majority of time spent in the entire process is associating the viseme and muscle movements with your blend shapes. However, once this step is complete your character is fully capable of performing complex facial movements and lip-syncing to achieve a range of emotions.

Animate your FBX

The iClone Animation Pipeline works with any Biped FBX from 3ds Max, Maya, DAZ3D or other tools. Import and set up your own FBX character to create animation for faces, body and to lip-sync with ease. This tutorial demonstrates the Autodesk Character Generator characters, but you can import and animate a rigged character from any 3D program.



04 Export into iClone

Once the character conversion and setup is complete with 3DXchange, it's time to export your character into iClone. By exporting your character, it will create an iClone file that loads into the iClone Avatar/Custom folder. In iClone, find your actor and load it onto the stage by double-clicking to add the actor to 0,0,0 or click and drag the actor to put it anywhere in the iClone scene.

05 Animate and lip-sync the character

Animating your actor in iClone can start with either the face, body or lip-sync and all can work with your ideas in a non-linear fashion so you can start where you feel inspired to. Animation in iClone begins with the Animation tab, where you will find Motion, Facial Animation, Hands and Path. The Motion area replaces the iClone Modify Panel with body-motion options for animation. Pick from Motion Puppeteering, which does customisable idle motion, walks, runs and emotive gestures, or choose to animate with HumanIK-assisted keyposing or use the 3D mo-cap motion library. The Idle Motion Puppeteering is a great choice if you are working on character dialogue or monologue and need a simple motion that can add effective behaviour. Select Facial Animation to enable the Modify Panel with the Facial Puppet and Lip-sync Animation tools. Select Puppet to puppeteer the face with any combination of facial features and muscles. To create a lip-sync, record or import an audio file from the Modify Panel. Complete your animations to then prepare the character for exporting again.

06 Finalise and export your animation

Inside iClone go to the Avatar tab and then from the Modify Panel, select Edit in 3DXchange. The character model will reload into 3DXchange. Inside iClone, select F3 to open the Timeline and view your character's animation tracks. Next, use the Collect Clip track to select the area of time that you want to export. Click and drag the Collect Clip area of interest to export it, then right-click the area to select Add MotionPlus To 3DXchange. The MotionPlus file will then collect the character's facial and body animation into one file. This MotionPlus animation file is then loaded back into 3DXchange. Once opened in 3DXchange you can export your newly animated custom character as an FBX file back to Maya, 3ds Max or any other production tool. To do this, go to Export>Export to Other 3D Format, then check the FBX settings and features you'll need.

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Photoshop

Fix your renders

"When it comes to post-production in Photoshop, what elements should I be focusing on?"

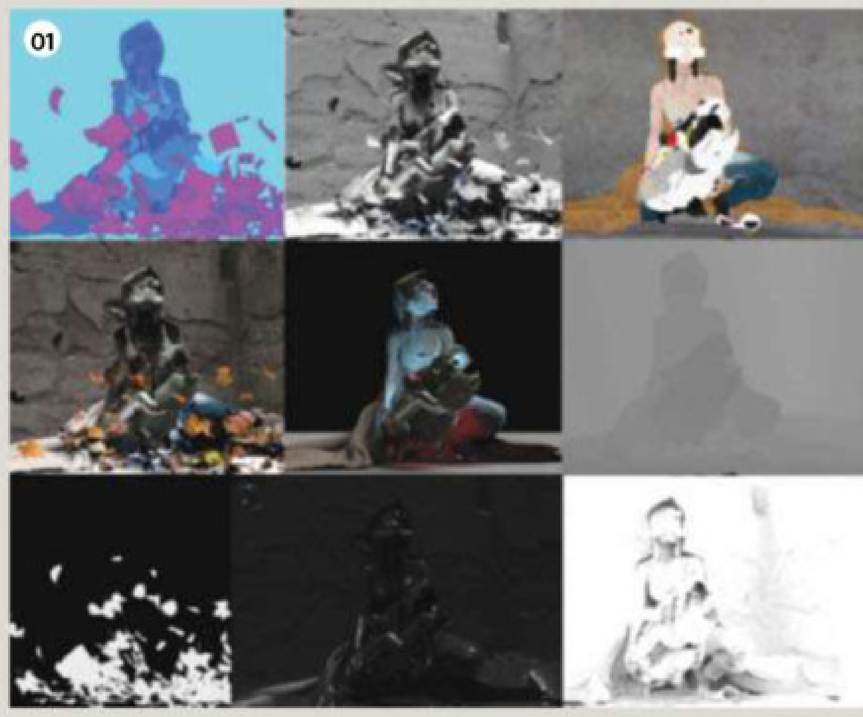
You startle awake, the first rays of morning sunlight creeping in through your window and across your bleary eyes.

You pick your head up off of your tablet and try to rub the impression of the keyboard from your forehead. Squinting, you glance at the screen. The progress bar that you had doubted worked the night before is now greeting you with a cheery 100%! Finally, after hours, days or even months of hard work, your final work has completed its render. At first you feel exhilarated, but the feeling soon fades and you're left asking yourself, what next?

As 3D artists, we strive to do everything possible inside the 3D programs. However, other programs such as Photoshop can provide equally impactful effects – it's not just for cleaning up and colour corrections.

When you take a rendered image into Photoshop, you need to think of it as a 2D work as well. Many traditional techniques, such as composition and adding drama, become extremely important. Before stepping in to retouch a render, it's important to collect reference images for the kind of mood and atmosphere that you want to create. This is a good way to explore colours that will fit your image.

Think of it as making soup. Grab images, even if they have nothing to do with your subject, but you just like the look. Not every ingredient is noticeable in it, but without all those little bits, the soup will seem bland. It's the same kind of idea with images. When you're switching back and forth between references, the images will get sucked into you train of thought and will influence your decisions.



01 Gather your renders

Let's start off in the render software. Programs will vary on the different passes that you can get out of them, but they all have the same concepts in theory. Personally, I like to have a full render, Alphas for the separate pieces, a Depth pass and a Shadow pass. Once we've got all those, go into Photoshop. Go to File Menu>Scripts>Load Files Into Stack. As you can probably guess from the name, this will bring all of your renders into one neat PSD.

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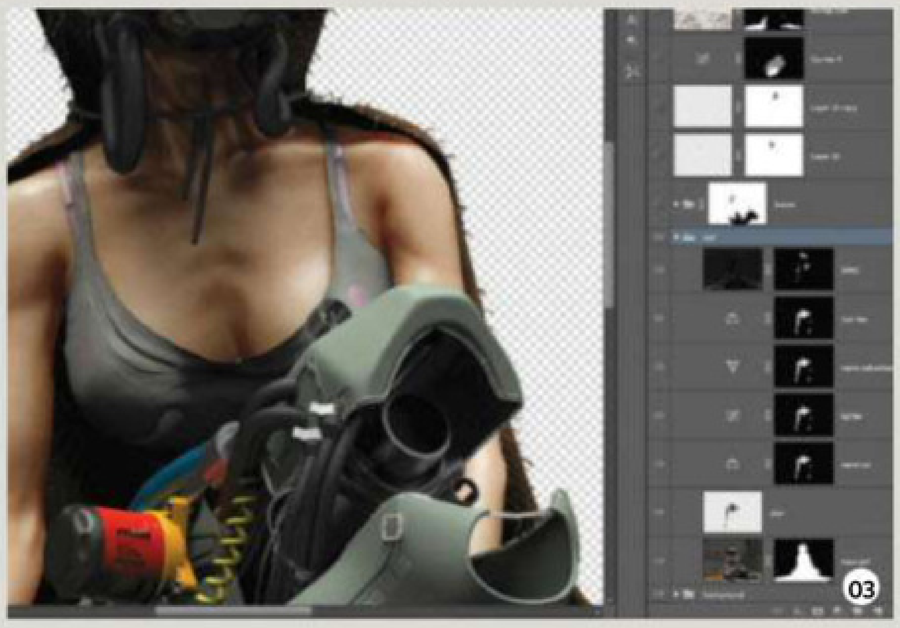
02 Get into it

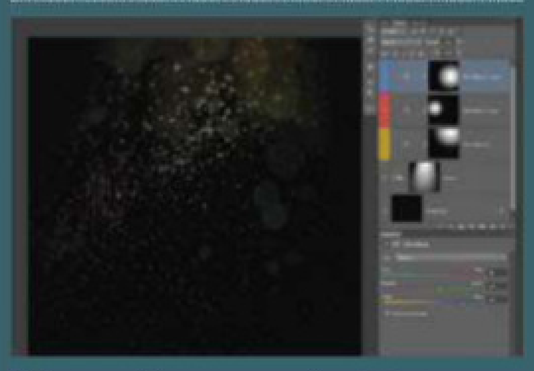
At this point, organise your layers as well as you like and make any global adjustment using adjustment layers such as Color Balance and Curves. Think about this like blocking out, and don't get too detailed with it. Then group all of the base layers together to keep things neat. Pop a new layer on top of that and do any clean-ups that you need to do with the Clone Stamp and the Heal brush. Once again, group everything from here together and label them Base to keep everything as clean as possible.



03 Work deeper

At this point you may be wanting to grab a piece from one of your alternative renders. For example, the skin in this one looks a bit dull, so I rendered out a new one with some more colour. To comp it in without being too overt about it, bring it in with its Alpha from the render, then put it in a group by itself. Set a mask to that group and you can use a gradient to really subtly fade in the new section. This can be repeated as many times as you like and offers a lot of versatility to your masks.

Include dust



I like to add some specks of dust to create more atmosphere and drama. This can become a really powerful yet subtle effect when you start adding Gradient masks, colour and lens blur. Make a couple of layers and add some depth of field as well.

04 Add extra texture

Let's add some more texture. This is fun because you get to think about your piece in a real-world setting. Find some sharp corners and break them down a bit with just a regular round brush. Grab some images and lay them out, jog through the different blend modes and mask out what you don't want. If you're bringing in photos for textures, try Transform Warp to help it look like it's running along the surface. You can also use Puppet Warp to get those really stubborn ones shaped.

05 Detail your image

Get the paintbrush out and do some stretches. Try to pick good places to concentrate on. Extreme detail all over an image can be too busy, but just enough detail in the places where your eye naturally falls can really make a piece. Try to concentrate on places where materials meet and obvious attention points (such as eyes, faces and so on). If you have a character, try something called flagging the head, where you create an area of contrast around the head to give a stronger profile. Use different brushes for texture and experiment a lot. Try to really think about what is making that texture look like that. Spend extra time refining the Specular Highlights – oftentimes an entire surface can be defined by the tight little speculars.

06 Create mood and atmosphere

At this point, pop a flattened version of the image on top by pressing Opt/Alt+Shift+E to keep things simple. Take a moment to soak up your image. The mood may be completely different from when you started, but that's fine. Don't fight it – once you have decided what the mood is, then we can start doing things to elaborate on it. Again, use Curves and Color adjustment layers. Color Balance layers stack really well together, so never be afraid of using too many. Atmosphere can help tie the image together and reinforce the mood. One way to start is to pick a light colour from your scene, then on a new layer on top, use the Circular Grad tool and pull out from where the strongest light source is suggested. Then use the blend modes and Opacity to adjust it. Another good trick to pull it all together is to pop a layer of mid-grey on the very top, then set it to Overlay. Next, add some monochromatic noise to the gray layer – this will almost definitely be too strong, so again blur and adjust the Opacity to get the right look. This gives everything a consistent grain, much like film, and can also help to even out tones.

• **DID YOU KNOW?** • All tutorial files can also be downloaded from: **www.3dartistonline.com/files**

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I made this...

Incredible 3D artists tell us behind their artwork

Daniel Kho

Website www.danielkho.com
Country USA
Software Maya, ZBrush
Bio Daniel is a Malaysian-born artist currently studying in LA. His passion is bringing 2D concepts to life in 3D

"I had a lot of fun with the faces, especially Dracula's, for which I used a cube as a base mesh. After the basic sculpting I made sure to add the tertiary details with Alphas. Wrinkles and little pores on the skin really add to the character"

The Count 2014

I chose to re-create this amazing 2D concept by Remi Salmon in 3D because I feel that it has very appealing characters and a richness of story. I thought that it would be a great challenge to tackle the intricate details of the folds and wrinkles of the dresses. The process took me about a week, from block out to finish. It was a fantastic experience!

Viewport 2.0 allows you to see your Bifrost simulation as you work

Autodesk Maya 2015

Dave Scotland puts the new release through its paces – does it live up to the hype?

REVIEW BY Dave Scotland, VFX artist, animator and lecturer at AIE, Australia

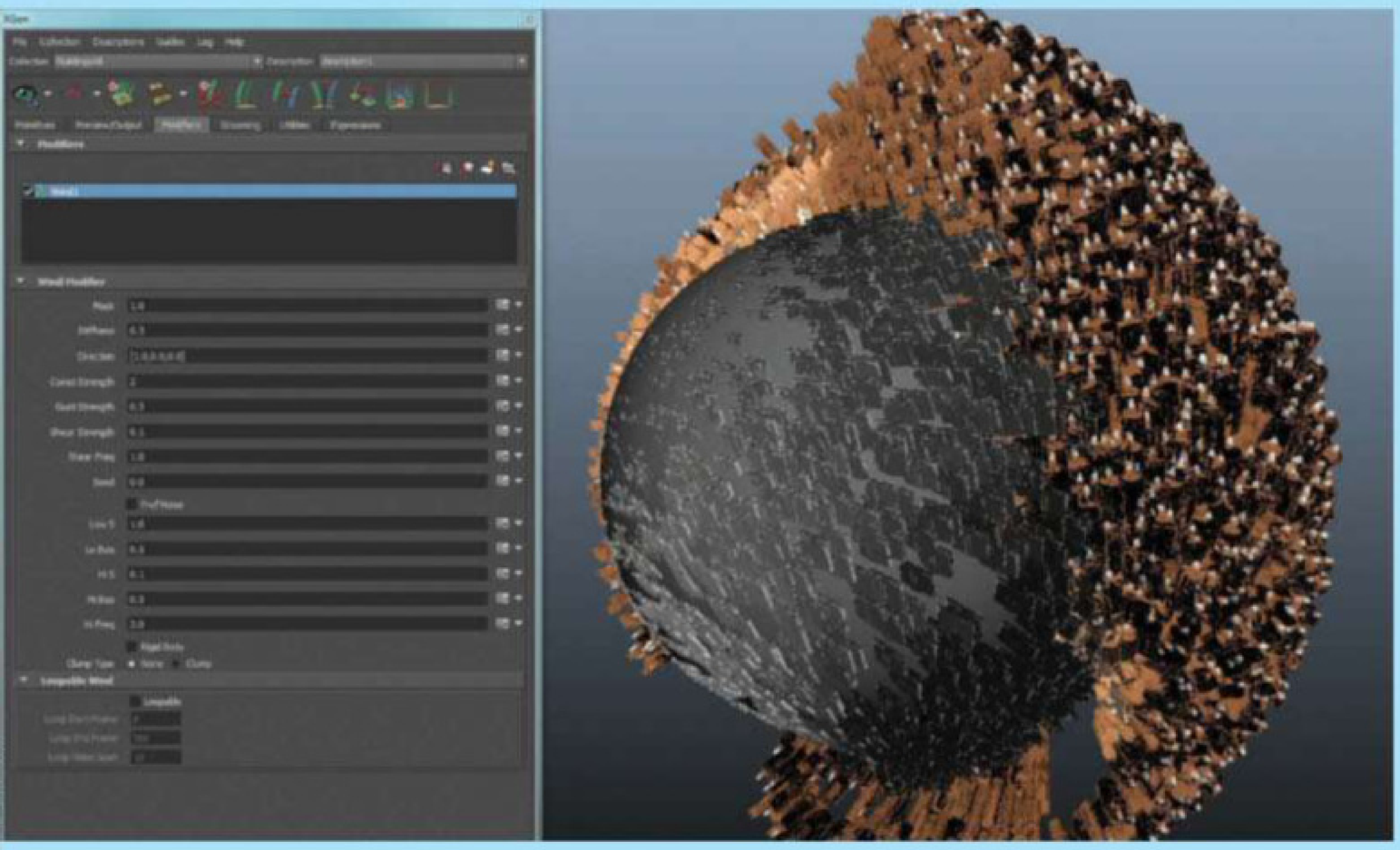
I prefer to tread gently when it comes to major software updates. Usually I'll hold off until the first service pack release, which seems to be the standard for a lot of the artists I've worked with. So when asked to review the brand-new Maya 2015, only a few months old, I was surprised to see it was already up to its second service pack.

I started with the feature that everyone had been talking about – Maya's brand new fluid system, Bifrost. As a rebirth of the Naiad fluid simulation system from Exotic Matter, Bifrost is certainly geared towards giving 3D artists a powerful fluid dynamics toolset without having to be a technical director to use it. In fact, I was able to get some great results very quickly and without a huge amount of downtime. The setup was simple and the available settings allowed for a good degree of customisation. However, if you are a TD and want access to the procedural graph, you will be disappointed (though future releases will have this ability). If you've always wanted to get your feet wet with fluid simulations (pardon the pun) then you will definitely enjoy playing with Bifrost.

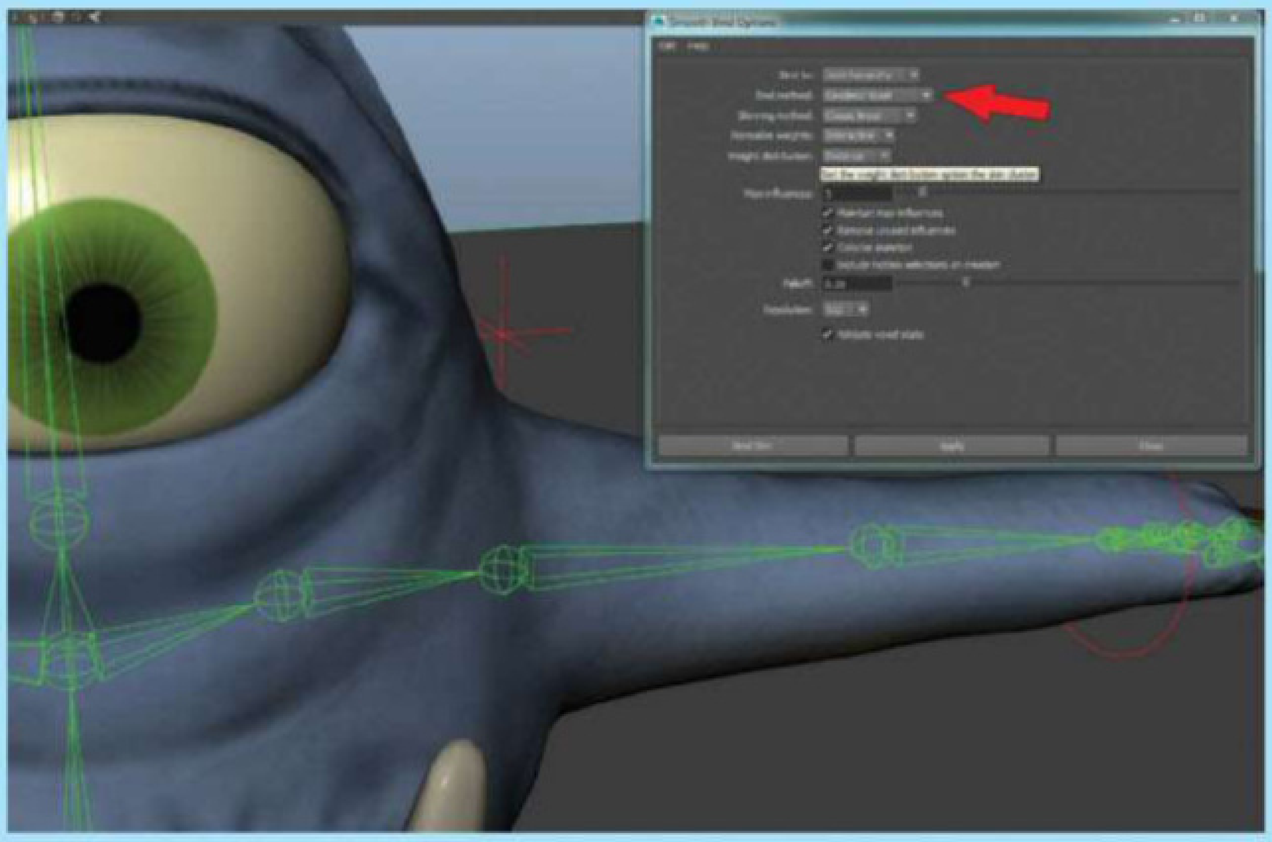
One of Maya 2015's features that was previously only available to subscription holders is the XGen system. XGen is a primitive geometry generator, which gives you the ability to populate the surface of an object with repetitions of another object or objects. The obvious uses for XGen are hair, fur and foliage, but the possibilities have a much wider-reaching range.

The feature that provided a huge wow-factor for me was Viewport 2.0. With everything I was throwing at Maya 2015, the viewport gave me great feedback and the many new features supported by Viewport 2.0 massively reduced the need to progressively render the scene. In fact, from a look-dev perspective, I don't know how I used to work without it. It is also the new default viewport renderer for Maya and new users won't know just how lucky they are.

For someone who regularly uses extremely high-resolution character meshes, another standout feature was the use of Pixar's Open Subdiv libraries as Maya's new default subdivision-surface method. By replacing the Catmull-Clark method with Open Subdiv, I noticed a massive



Hair and fur are a simple process with Maya's new XGen system, but it's worth also trying out some abstract and creative projects with it



Now you have even more options for skinning your characters, thanks to Geodesic Voxel skin-binding

improvement to viewport feedback and scene response. This development, together with the Viewport 2.0 renderer, really made me change the way that I work. I no longer need to worry quite so much about dumbing down the scene to improve the overall responsiveness of the system.

The Geodesic Voxel skin-binding system also looked great. I achieved some top-notch results without spending too much time tweaking. I also liked the compatibility with existing solutions and how it will easily port to most game-engines. I look forward to playing with this feature in more depth.

Other additions and reworks, such as the ShaderFX, Bullet Physics, Enhanced UV toolset, QuadDraw, mental ray and Alembic Caching: all seemed to be excellent improvements. There were some polygon-modelling features that might need some improvement and although the recently added Modeling Toolkit was a step in the right direction, Maya 2015 is not my personal favourite 3D-modelling application...yet.

As for being up to the second service pack, it has probably got more to do with being such a huge release. I found that it suffered from very few bugs and it only crashed once due to user error.

Maya 2105's new features are definitely great, but what really impressed me were the improvements made under the hood. The ability to work without technical restrictions and with little downtime is crucial to any productive artist and this is where Maya 2015 has certainly delivered.

Essential info

Price: £3,200 (excl VAT) / **$3,675 US** (monthly, quarterly, yearly plans available)

www.autodesk.com

OPERATING SYSTEMS

- Microsoft Windows 7 (SP1), Windows 8 and Windows 8.1 Professional
- Apple Mac OSX 10.8.5 and 10.9.x
- Red Hat Enterprise Linux 6.2 WS
- Fedora 14 Linux
- CentOS 6.2 Linux

OPTIMAL SYSTEM REQUIREMENTS

- 64-bit Intel or AMD multi-core processor
- 4GB of RAM (8GB recommended)
- 4GB of free disk space for install

The retopology toolset has been reworked to include elements like Relax and Tweak, making the system even easier

The good & the bad

- ✓ Viewport 2.0
- ✓ Bifrost
- ✓ XGen
- ✓ Enhanced UV tools
- ✓ Open SubDiv support
- ✗ Polygon-modelling functions
- ✗ Bifrost procedural graph lockout

Our verdict

Features	9/10
Ease of use	8/10
Quality of results	9/10
Value for money	8/10

"A very strong update. Great new features and some fantastic workflow improvements"

Final Score 9/10

Pixellusion's FX department used RealFlow 2014's new features to simulate a cool splash for a Wilkinson television advert

RealFlow 2014

Pixellusion takes an in-depth look at the latest fluid simulation features in Next Limit's RealFlow 2014 release

REVIEW BY Sebastian Stanek, CEO of pixellusion

Here at pixellusion we use RealFlow as our main fluid tool for commercials, television and feature film VFX work. As a small VFX studio with 5 to 15 people, we were looking for an off-the-shelf fluid toolset and eventually we came across RealFlow.

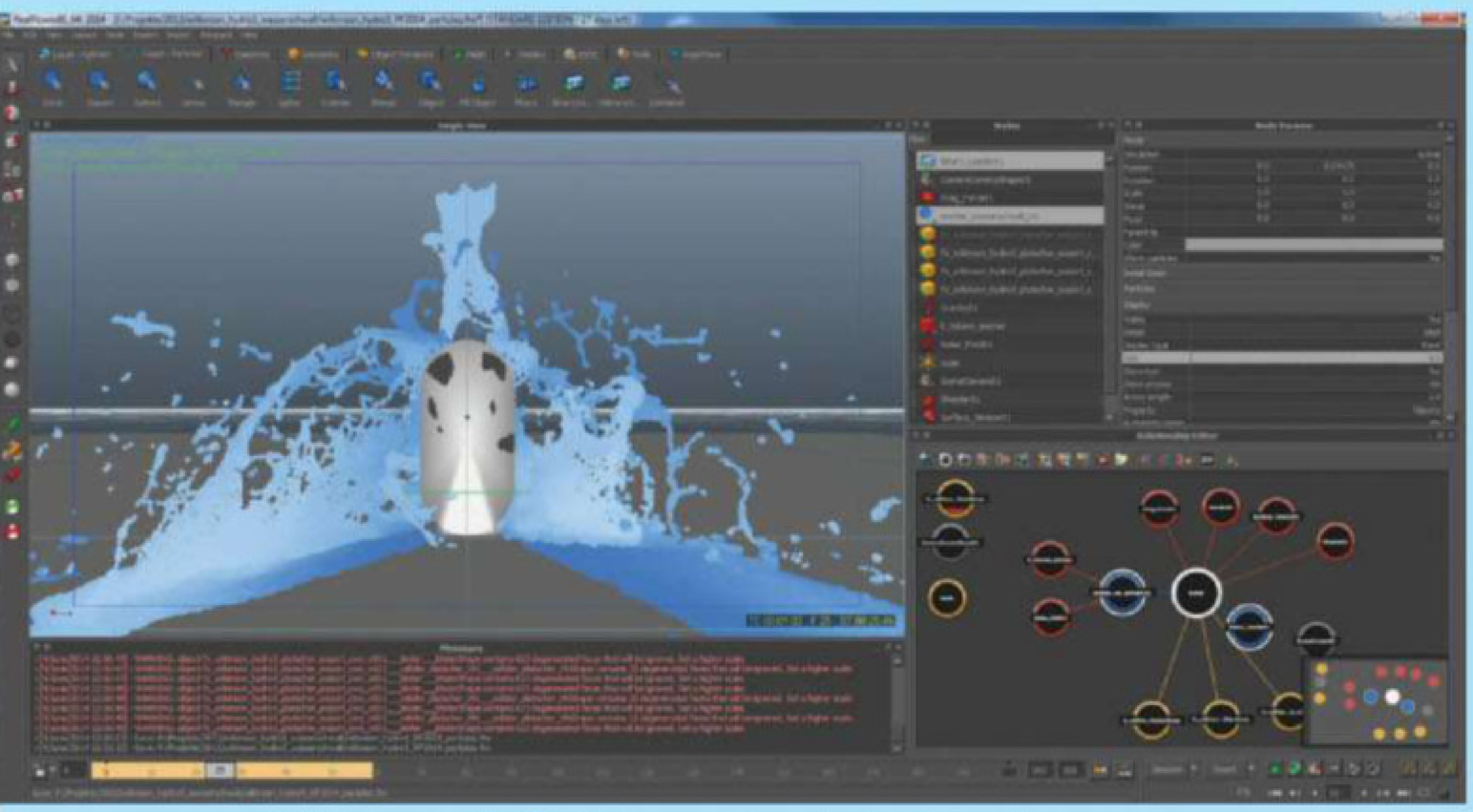
Our company is constantly tasked with creating cool, realistic fluid simulations in a very short period of time. For this reason, every year we're excited to find new features in RealFlow that make our job a little bit easier. With version 2014, Next Limit has once again listened to its customers and added some really helpful new elements.

Depending on the type of a new project, we have to decide whether to simulate with a particle-based solver (SPH) for small-scale fluids or use the Hybrido approach (FLIP Solver) for large-scale fluid simulations. In our day-to-day work on commercials we also have to be able to art-direct fluid simulations. Commercials have to look cool, as well as follow the clients' expectations, which – most of the time – aren't based on reality or physical correctness.

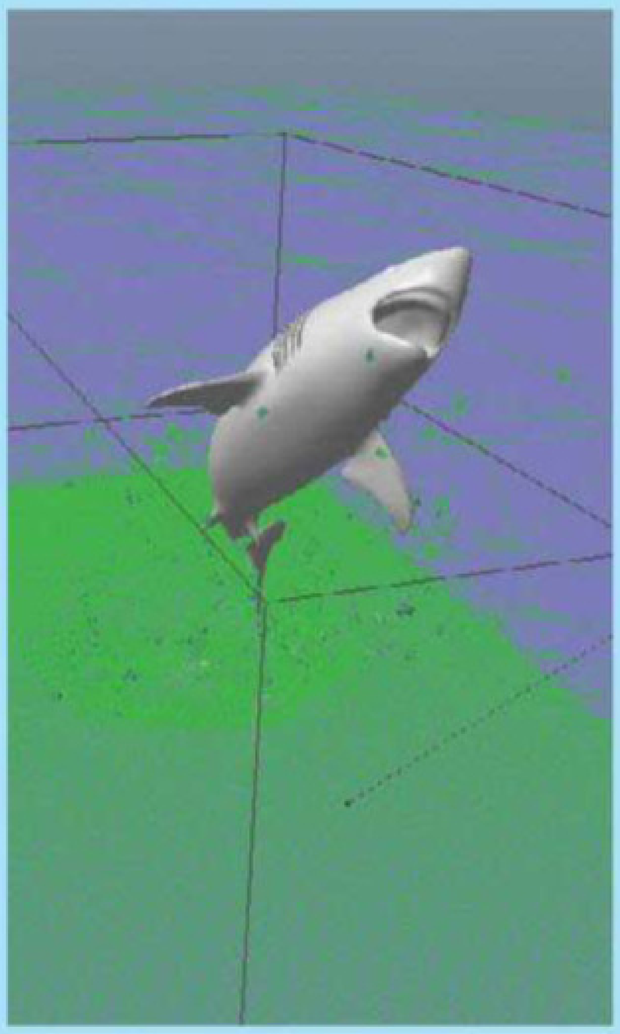
For our latest Wilkinson commercial, we had to create a water splash in slow motion. The new Sheeter Daemon and the ability to display Forces directly in the Editor helped a lot in achieving the exact look that our client expected. In previous versions there was a lot of guesswork involved when working with Daemons, but it's now possible to switch on a Vector Display of the Daemon Forces to immediately get a better understanding of how the fluid will react.

The new meshing algorithms and interactive filtering helps to create exactly what the client is looking for. Combining these techniques with the integrated Maxwell 3 preview enabled us to sit down with clients and tweak the mesh while looking at a rendered version almost in real-time. Just a few years ago this would be almost unthinkable – or you needed to have a lot of interesting stuff to talk about until you finally had a render that your client could take a look at!

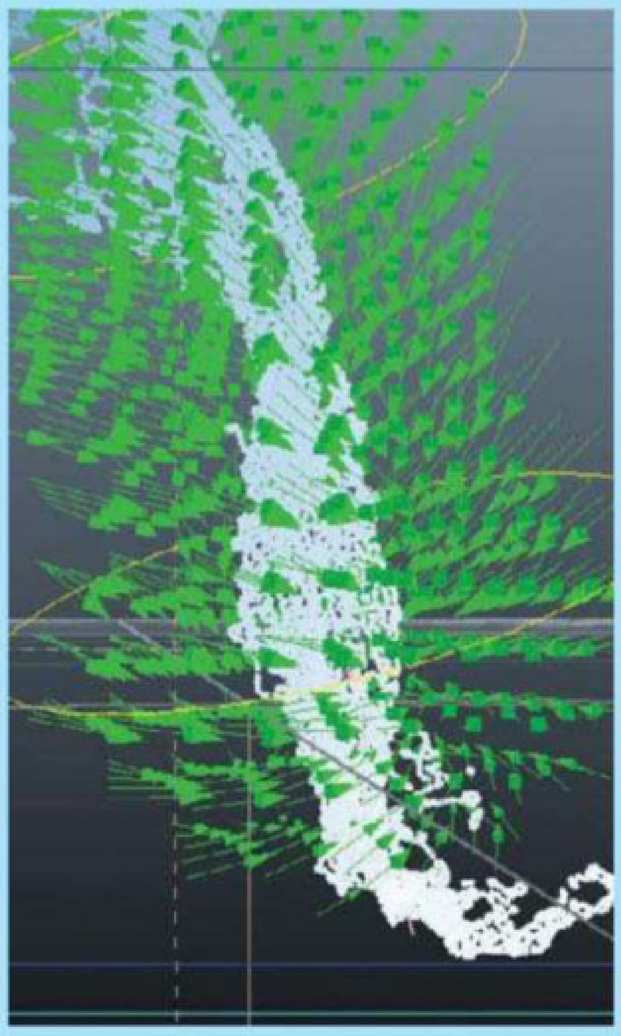
Flooding a city or objects crashing into the ocean are scenarios where it all comes down to simulation resolution and particle counts. We have to be as physically correct as possible to make the fluids look believable and integrate well into the scene. This is where we can put Hybrido2 to use. To give our simulations more detail, we use the new splash particles. These splashes can now be calculated by Hybrido's FLIP solver instead of the SPH solver. This way RealFlow can take



The latest version of RealFlow features a newly organised interface, made up of new UI Shelves to make working a simpler process



The mesh boundaries can be extended thanks to the Extension tool, which is useful for creating oceans



The new Forces display enables artists to immediately see how fluid will react to its simulation settings

full advantage of multithreading and closely match the main simulation.

Another neat new feature makes it possible to seamlessly extend the boundaries of meshed simulations. Now we have the ability to concentrate all the calculation power to the most important area and use the extended mesh for rendering or blending it into real footage. Like all other meshing parameters, the extension will be done interactively in the viewport.

Perhaps not the most interesting feature for artists – but definitely worth mentioning – is the introduction of floating licenses. At last, it is much easier to cope with the license installation. It's a small feature compared to all of the fluid toolset updates, but it's a big plus when you think about a project with many switching users.

With the release of RealFlow 2014, every floating license is paired with a free RealFlow node, which can be used to solve fluid simulations or secondaries (foam, splash passes) or mesh generation over the network. Next Limit's new price structure also allows for unlimited render kits, so now we can squeeze even more calculation power in shorter deadlines and produce higher resolution fluid caches and much more realistic fluid behaviour.

Essential info

Price: €2,995 / $3,995
Node Locked: €2,000 /$2,500

www.realflow.com

OPERATING SYSTEMS

- Windows 7 or 8, 64-bit
- Linux, 64-bit
- OSX, 64-bit

OPTIMAL SYSTEM REQUIREMENTS

- CPU 64-bit Intel® or AMD® multi-core processor
- 4GB RAM minimum, 8GB of RAM memory is highly recommended
- Hardware-accelerated OpenGL® graphics card
- 1GB available hard disk space for installation
- Three-button mouse

Final render of a fluid simulation made in RealFlow

The good & the bad

- ✓ Great customer support
- ✓ Node-based workflow and scripting
- ✓ Easy pipeline integration / connectivity
- ✓ Maxwell 3.0 integration
- ✓ Clean interface with the new UI Shelves
- ✗ Learning curve is steep
- ✗ Quite expensive
- ✗ Not the most stable software

Our verdict

Features	9/10
Ease of use	8/10
Quality of results	9/10
Value for money	8/10

"A bit pricy and fluids aren't easy to learn, but RF 2014 is sure worth it!"

Final Score 9/10

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Hasan Bajramovic

workspace 3D

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Jason Howey

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“These actresses were very patient! It's a year between starting the process and getting the final CG pixies”

Jonathan Litt CG supervisor at Digital Domain. Page 104

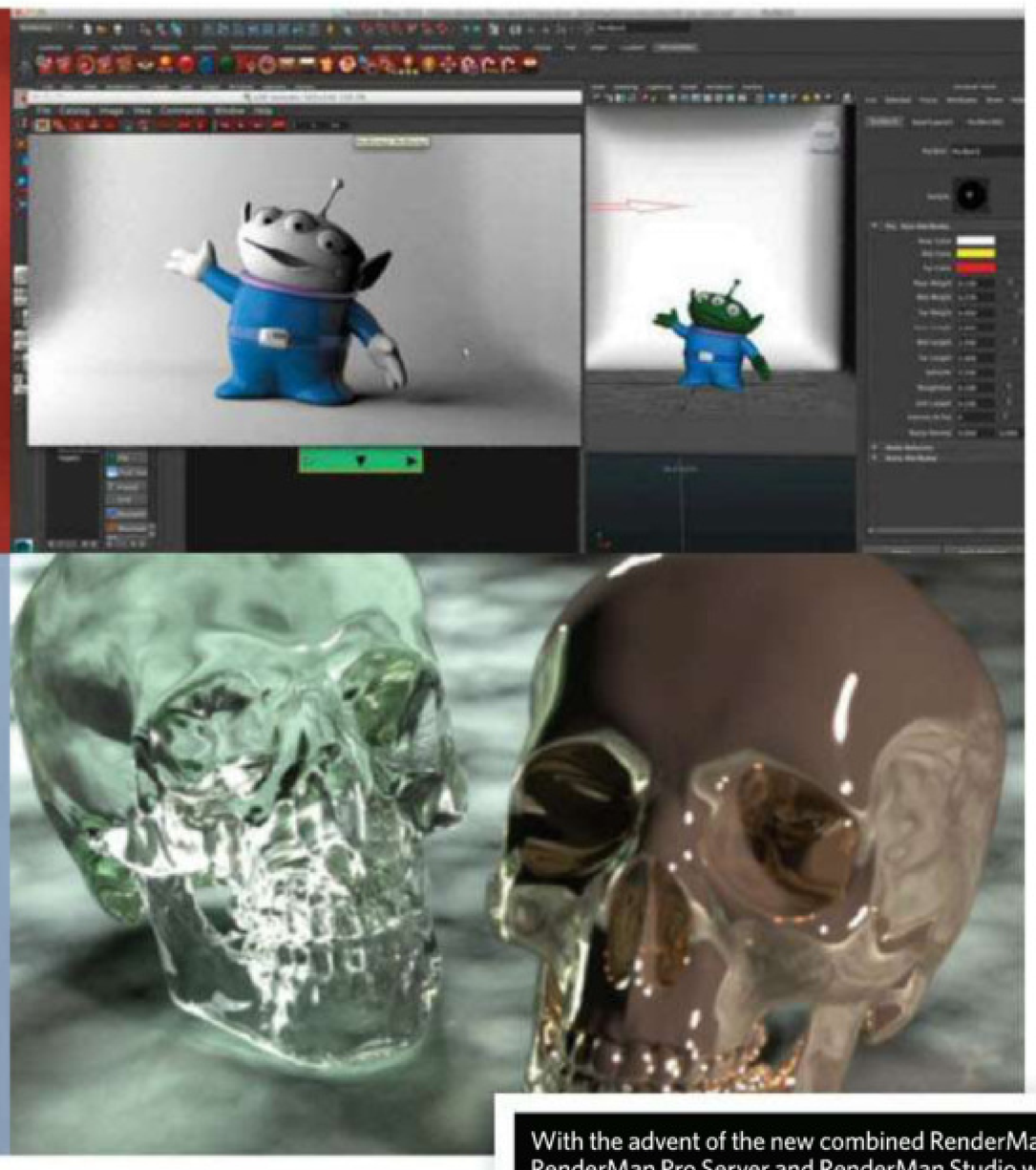
Facial mo-cap and animation for Maleficent

Digital Domain

Digital Domain and MPC worked together to give Maleficent a chance to tell her side of the story

To advertise in **workspace** please contact
Ryan Ward on **01202 586415** or **ryan.ward@imagine-publishing.co.uk**

You can register for your free license in advance on the RenderMan website at **http://renderman.pixar.com**. Purchases after the 29 May 2014 will qualify for automatic upgrade to 19.0 when released



Access Pixar's RenderMan for free

RenderMan becomes free to non-commercial users, while commercial users get the biggest discount yet

With the advent of the new combined RenderMan, RenderMan Pro Server and RenderMan Studio will cease to exist as separate products

Pixar has introduced some revolutionary changes to the way its illustrious RenderMan software – used on everything from *Toy Story* to *Harry Potter* – is to be priced.

In fact, the studio has said that as a commitment to the advancement of open standards and practices, a free, non-commercial version of RenderMan without any functional limitations, watermarks, or time restrictions will be made available for automatic download as a node-locked license. This is great news for student projects, developers, academic institutions, and for any other artist with a workstation, who can now start using a high-end renderer that's been tried and tested in production for 25 years.

The pricing has also dropped for commercial users, marking the third – and largest – price cut the renderer has seen in four years. Pixar is eliminating the distinction between the previously separate $2,000 RenderMan Pro Server and $1,300 RenderMan Studio, combining them into a single unified RenderMan product priced at $495 a license. However, if more than 25 licenses are needed, customised Peak Render Capacity packages can be configured to provide enough rendering capacity not only for everyday requirements, but also for additional burst rendering – something that should come in handy for those tight, last-minute deadlines.

The new version, RenderMan 19, will be released during the SIGGRAPH 2014 timeframe. It will include an entirely new rendering architecture named RIS, which is essentially several renderers within one unified framework that can be swapped in and out according to need. With several highly optimised methods of light transport, including path tracing and VCM, RenderMan's RIS framework can reportedly handle the widest variety of shots of any commercial renderer, as users can choose the most appropriate method of light transport for any given scene.

Defining non-commercial use

Pixar defines non-commercial as literally any usage that does not involve direct commercial use to generate profits. This means that evaluations, student usage, and even submissions to festivals or publishing work rendered in non-commercial RenderMan – with a credit on the image saying that it was rendered in RenderMan – is all perfectly admissible.

● **HAVE YOU HEARD?** Brecht van Lommel has announced he's leaving Blender to work with Solid Angle on Arnold

To feature in **workspace**[3D] please contact Larissa Mori on **01202 586239** or **larissa.mori@imagine-publishing.co.uk**

GRID comes to the UK

NVIDIA announces a way to test GRID technology

Having already rolled out the technology to the US earlier this year, NVIDIA has announced that anyone in the UK will now be able to test the power of the cloud for free with NVIDIA GRID technology. Though the GRID Test Drive can only be installed through a Windows OS – with plans to expand for both Linux and Mac OSX – it is very fast, only taking minutes to gain access to a personal virtual desktop without the need to first take more complex steps, such as building a proof-of-concept private cloud. For 24 hours, users have access to several applications to test run, including apps such as AutoCad and NVIDIA advanced rendering applications. Anyone using the Test Drive can even load their own files straight from their workstations, and then easily assess how much more efficiently things will run through the cloud, all in a virtualised environment.

Already rolled out in North America, you can view more info about the Grid Test Drive on the NVIDIA site at **www.nvidia.com/object/trygrid.html**

Sony VFX relocation

Imageworks to open a high tech facility in Vancouver

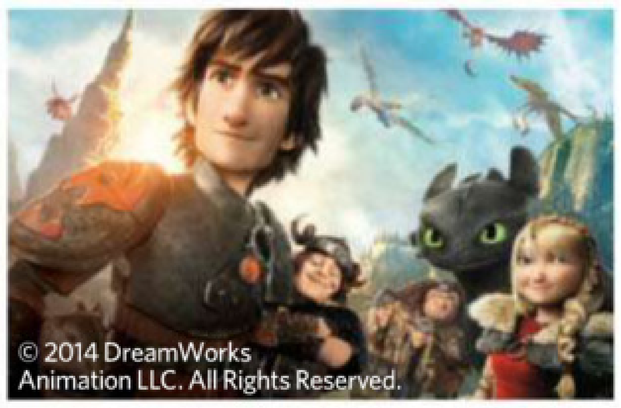
In a similar move to Digital Domain, which moved from Los Angeles to Vancouver, Sony Pictures Imageworks will also relocate its head office from California to Vancouver, where it's had a production office of 80 artists since 2010. That number will now go up to 700 artists with a new 74,000 square foot state-of-the-art production facility: the largest footprint for a VFX company in the city.

The Vancouver team will lead Sony Pictures Imageworks' current and future projects, including *Guardians Of The Galaxy* (Disney/Marvel), *Pixels* (Columbia Pictures) and the *Angry Birds* film (Rovio).

Like the UK, Vancouver has attracted many Hollywood productions as well as the VFX industry, due to the generous tax incentives it offers

The future of DreamWorks

DreamWorks Animation secures rights to Felix the Cat



DreamWorksTV, a new YouTube channel set to feature original live-action and animated series for kids, has also been launched at **www.youtube.com/user/DreamworksAnimation**

With *How To Train Your Dragon 2* opened to $50 million at the box office, marking DreamWorks Animation's best opening in two years, the studio has made several announcements about future projects. The latest trailer for upcoming feature, *Home*, about an alien named Oh and a teenage girl called Tip who team up to save the Earth, has just been released. The studio has also unveiled the acquisition of the rights to 95-year-old character *Felix the Cat*. Though CEO Jeffrey Katzenberg did not reveal specific plans for a film, he did note that the studio plan to make the cat one of the most desired fashion brands in the world.

Software shorts

Bringing you the lowdown on product updates and launches

Adobe Photoshop CC 2014

Adobe has officially launched Creative Cloud 2014. The update includes improvements to its desktop apps as well as the introduction of three mobile apps and the company's first foray into hardware products with a stylus and digital ruler for the iPad. New updates to Photoshop include several Blur Gallery filters and improvements to Content Aware Fill technologies.

Blender 2.71 release Candidate 2

The second release of the latest Blender 2.7 series is being wrapped up, including plenty of new improvements to the user interface, animation and features, such as motion blur on deforming meshes like animated characters and support for rendering fire and smoke. You can download the release candidate on the website. Visit **http://wiki.blender.org/index.php/Dev:Ref/Release_Notes/2.71**.

LightWave 3D and Sketchfab

The LightWave3D Group has teamed up with Sketchfab Inc to create a free plug-in for LightWave 11.5 and higher. The plug-in seamlessly exports 3D models directly from the 3D software to Sketchfab's popular online web platform, which enables users to publish, share, embed, and view interactive 3D models in real time. Download the LightWave plug-in for Sketchfab on its website over at **www.lightwave3d.com/assets/plugins/entry/sketchfab**.

New Star Wars

New standalone Star Wars film due for release in December 2016

Gareth Edwards will be working with British writer, Gary Whitta, on the script for the new spin-off film

Not only is *Star Wars: Episode VII* being filmed in the UK, a new unnumbered *Star Wars* film will be too, says George Osborne, UK chancellor of the exchequer. This *Star Wars* standalone will also be directed by *Godzilla*'s Gareth Edwards and filmed at Pinewood Studios, joining a roster of other recent features that have been made in the UK with local VFX crews such as *Gravity*, *World War Z* and *Captain America*.

The UK recently increased tax relief for high-budget films, allowing big productions to get 25% relief on the first £20 million expenditure, and 20% afterwards.

DID YOU KNOW? • *Astroboy* is being rebooted in a series combining 2D and 3D animation, along with *Sonic The Hedgehog*

Project Focus

Maleficent

Through demanding facial animation and expansive environments, Digital Domain and MPC have given Maleficent the chance to tell her side of the story

Project *Maleficent*
Description Maleficent curses Sleeping Beauty as an act of revenge. However, as Aurora grows under the negligent care of three fairies, Maleficent realises she may need more from the girl than she thought

MPC

Company MPC
Location London, Vancouver, Montréal, Los Angeles, New York, Amsterdam, Bangalore and Mexico City
Bio MPC has led the way in VFX for over 25 years, and its global teams are involved at every stage of the creative process, from initial concept art to final compositing. In 2013 MPC won an Academy Award for *Life Of Pi* and was the lead studio for *Godzilla*, *X- Men: Days Of Future Past* and *Guardians Of The Galaxy*
Website
www.moving-picture.com

DIGITALDOMAIN

Company Digital Domain
Location Los Angeles, Vancouver
Bio Founded in 1993, Digital Domain has worked on films such as *Iron Man 3*, the *Transformers* series and *Titanic*. A creative force in advertising, it pioneered the creation of Virtual Performers. Digital Domain was also a co-producer on *Ender's Game*. After being sold by its owners, Digital Domain is now owned by Hong Kong company Digital Domain Holdings Limited
Website
www.digitaldomain.com

The perfect casting of Angelina Jolie as Maleficent, the good fairy gone bad, has created a lot of hype around Disney's latest visit to the *Sleeping Beauty* myth. Like *Wicked*, the film takes a well-known story and then re-tells it from the villain's point of view, proving what all good screenwriters know: even baddies don't think of themselves as baddies. Here, it is only after Maleficent is attacked by her childhood friend, Stefan, that she turns to the dark side and curses his daughter, Aurora.

Digital Domain and MPC did the bulk of the VFX work, with the former tackling the facial animation challenge of the three flower pixies played by Imelda Staunton, Juno Temple and Lesley Manville, and the latter focusing on the environments that would bring the fairy world to life. For both companies, the way the human world and the fairy world felt and interacted was vital. First-time director Robert Stromberg has a strong background in production design and matte painting, and he and Dylan Cole set the tone for the film – a dark, striking and rich version of nature – in the concept art. "As much of the movie was on green screen, they needed to have a good idea of the world before shooting the principal photography," explains MPC's lead environment TDs Julien Bolbach and Audrey Ferrara. "Although the look did continue to evolve during post-production, it always had a feeling of extra-realism."

"Stromberg had a clear vision on how this world was supposed to look and feel," adds Jonathan Litt, CG supervisor for Digital Domain. "I think when you see the movie you really get the sense that you're in another world, but it is grounded in a reality, it isn't a full CG feature." However, that mixture of reality and fantasy gave Digital Domain a bit of a mountain to climb when it came to animating the flower pixies.

Staunton, Temple and Manville were cast as the flower pixies charged with looking after the baby Princess Aurora, and it was Digital Domain's job to turn them into tiny CG pixie versions of themselves. However, the characters also masquerade as human at times, meaning the audience could compare them to the real thing. This meant there was no room for error when creating the diminutive digital doubles.

Thankfully, Digital Domain have a lot of experience in this when it comes to *The Curious Case Of Benjamin Button*. "We had to make the character look older, and we came to learn that [CG] was one of the most forgiving ways of doing it, because the older person's face has more surface detail, like more wrinkles and

> "It is generally considered a rule in visual effects that the demands of a task will expand to utilise the available time, and that was definitely the case here"
> **Jonathan Litt,** CG supervisor, Digital Domain

Contributors

Julien Bolbach Lead environment TD, MPC
Audrey Ferrara Lead environment TD, MPC
Patrick Harboun Senior modelling & texture artist, MPC
Arvind Sond Head modelling & texturing artist, MPC
Jonathan Litt CG supervisor, Digital Domain

A The pixies made up around half of the work that Digital Domain did on *Maleficent*. The team also worked on the creation of Angelina Jolie's overwhelmingly large CG wings, which required a great deal of look development to get the look just right

To submit your project to the **workspace**[3D] please contact Larissa Mori at **larissa.mori@imagine-publishing.co.uk**

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Clothing conundrums

Maleficent herself didn't require a facial digital double, but Angelina Jolie was scanned with her prosthesis and make-up applied so Digital Domain had a double

"What was especially challenging for *Maleficent* was doing digital copies of each of the character's outfits," explains Jonathan Litt. "She wears everything from long flowing dresses to skin-tight leather. All of the outfits were scanned and replicated digitally. She has many flying scenes where her dress is undergoing extreme motion due to the air or action – like during the battle sequence – and choreographing the digital dress was a challenge. Angelina was shot on a flying rig for several shots, but often her dress would become wrapped up around the rig, and the only way to fix it was to replace the entire dress with a digital version."

more surface skin spots and things like that," says Litt. "Conversely, on *Tron* we had to make Jeff Bridges look younger, which was quite challenging. Whenever someone's skin is smooth and has less surface detail it's less forgiving, but in the movie he was in this computerised world.

"Now we have three characters, and they have much more of a range of emotion and much more dialogue," he continues. "The characters are also essentially the same age as our actresses, so the standard for matching the actors was the highest compared to our previous efforts. Not to mention that the animators on *Maleficent* usually had to solve and animate three separate faces in each shot, in addition to working on complicated body motion that often involved interacting with the other pixies. It is generally considered a rule in visual effects that the demands of a task will expand to utilise the available time, and that was definitely the case here."

The first step in Digital Domain's facial animation pipeline is a high-res facial scan at the University of Southern California, which provides a base geometry of the person's face, all the way down to pore-level

B "Robert Stromberg was very involved during post-production, and would send us new ideas drawn on top of our latest matte paintings," explains Julien Bolbach and Audrey Ferrara. "That was really unique to have from a film's director!"

C Photoshop and NUKE were used to achieve the most straightforward 2.5D sequences, while for the fully CG environments, MPC primarily used Maya, MARI, ZBrush and SpeedTree to create all of the assets needed for the shots

D "There is definitely an economy of scale when you have more than one character," says Jonathan Litt. "Certain things are nearly universal for all faces, so once you have a set of rules, they can be applied to any face, even if the shape is different."

E *Maleficent* is a modern take on the classic *Sleeping Beauty* tale, with an interesting twist. Despite this, much of the original story is retained, such as the curse condemning Aurora to slumber, which she can only be awoken from by true love's first kiss

detail, and the second is another recording session in which they capture the FACS shapes. Once it has both still geometry and geometry-in-motion, it is all combined into a facial rig, each of which is capable of creating expressions from a recipe of nearly 3,000 high-resolution sub-expressions. With the rigs in place, it gave the team the first automatic step, which the animators could then work on.

Next came another facial motion-capture session to record the actors saying the lines and giving their performance. Because the pixies were flying around, the actresses had to be filmed on flying rigs too. "Facial animation is very tied to the body motion," Litt explains. "If you have these pixies flying around the room where they're kind of hovering in the air and changing directions a lot, the animator has to go in and make sure that the facial animations work with that body motion."

Litt says that Digital Domain has got the pipeline down pretty well these days, but each new feature project is a chance to develop new ideas. With the pixies, a further complication was that even before the roles were cast there was lots of design work completed on the characters, so making that fit with the proportions of their faces and bodies – both in the real versions and their CG pixie versions – was tricky. "Because we knew that was going to be evolving and changing going into it, the way we designed the workflow was that we also created matching CG versions of the actresses without any proportion changes, just direct CG facial rigs of each actress," explains Litt. "We knew that the character design would change for a while before finally getting locked down, so we did all of our facial solving directly on our CG version of the actor's head. It was sort of a milestone to make sure we could show that directly and say 'look, we're getting this performance in the actors now'. If there are any questions about the performance of the pixie, it's simply a question of the design of that character's face and the transformation from the actor to the pixie."

One aspect of the pipeline that benefited from the pixie experience was the way the facial wrinkles can now be rendered. "As you go through expressions, the skin wrinkles and gets more or less red because you're putting pressure on the blood vessels in your skin," explains Litt. To add this feature, the team studied the anatomy of blood compression, and applied their findings to the facial rig.

While Digital Domain was getting under the skin of the pixies, MPC was building a world for them to inhabit. "From the long, panning opening shot leading from the human world to the fairy world, we built the rowan tree and its surroundings, the jewel pool, the fairy mound, castle and many other environments for smaller sequences," say Bolbach and Ferrara. For the lead environment TDs, it was tackling the vastness and richness of the world that proved to be the major challenge.

Efficiency was also key, so they used a 2.5D approach for the smaller sequences with fewer shots, with traditional matte paintings projected on cards. "We also had to create full CG environments for the biggest fly-over shots, along with combinations of the two," Bolbach explains. With the matte-painting team handling some sequences, MPC put together a team of artists from different departments (modelling, texturing, look-dev, layout, environment) to create a library of the assets needed for the full CG

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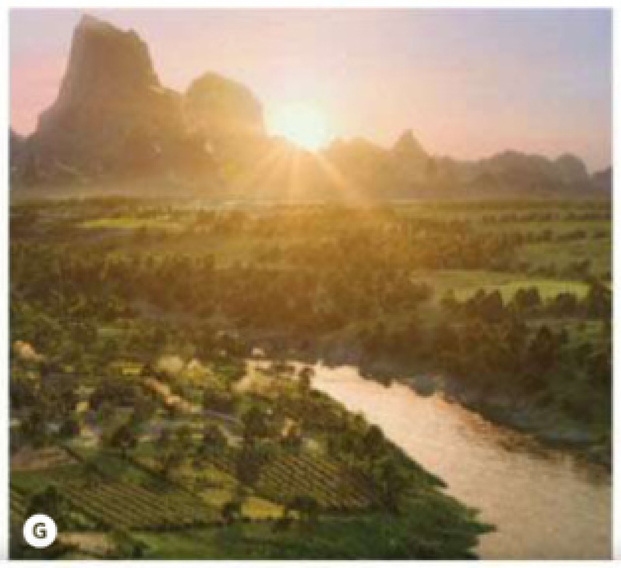

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Diaval the dragon

Another character the VFX team had to bring to life was Diaval, a shape-shifter who can transform into a raven, wolf, human or dragon

MPC created the dragon version of Sam Riley's Diaval character. As Patrick Harboun explains, the challenge was to bring the raven, wolf and human elements in, "while still paying tribute to the emblematic *Sleeping Beauty* dragon." To do this, they took elements from each incarnation. "We adapted the angular horn, head and neck profile from the *Sleeping Beauty* dragon," he explains. "From the human part, we took Sam Riley's widow's peak. The wolf inspired us for the legs and the body musculature. As for the raven, we drew elements from its beak for the snout and integrated feathers into the design. We also re-created a top-view silhouette by adding extra digits to the dragon's wings and splitting the tail in a fan-like form. The hardest part was balancing these elements for a natural, believable result."

F "These actresses were very patient!" admits Litt. "The amount of time they had to sit in a chair and have lights or cameras scanning their faces or be covered in dots. It's at least a year between starting the process and getting the final CG pixies."

G "Robert Stromberg was a matte painter to begin with, and I think you can feel that influence in the way he directed *Maleficent*," says Bolbach. "Working on environments was a great opportunity as they are such an important part of the film."

H "Whether Diaval the dragon would fly was still unconfirmed when we started the concept. Since a considerable creative effort was put into the design of the wings and tail, I would have loved to see him flying!" says Patrick Harboun

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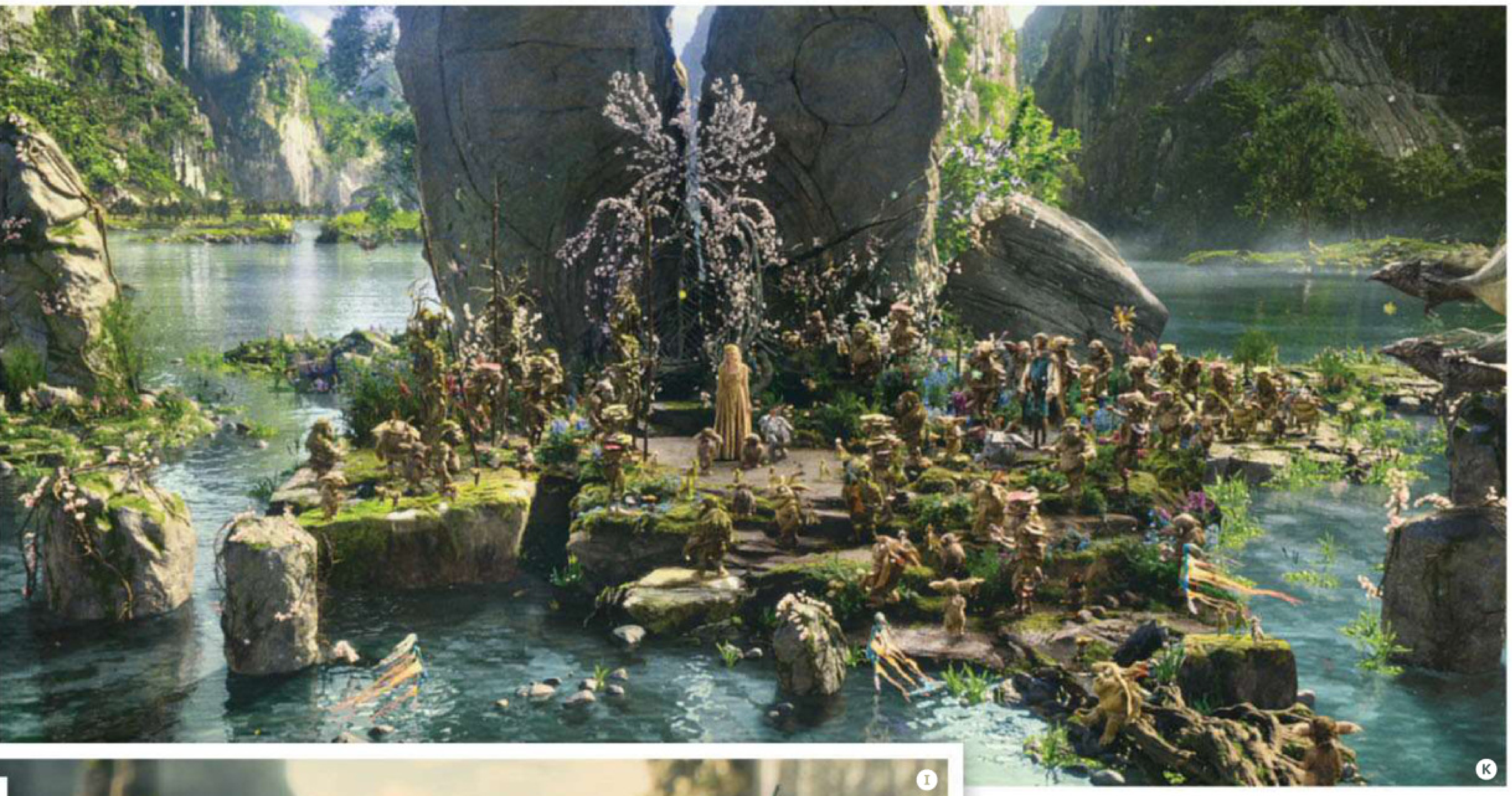

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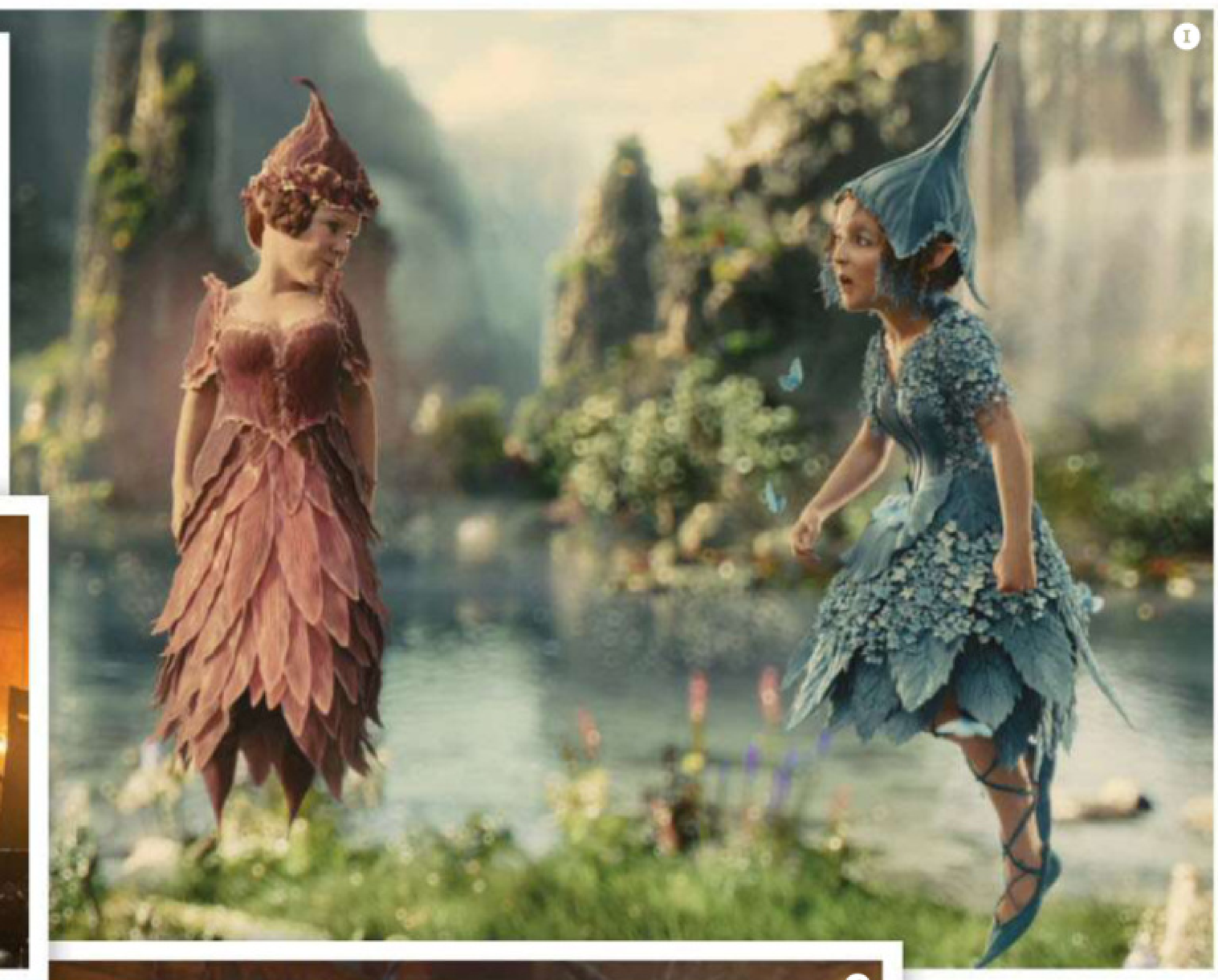

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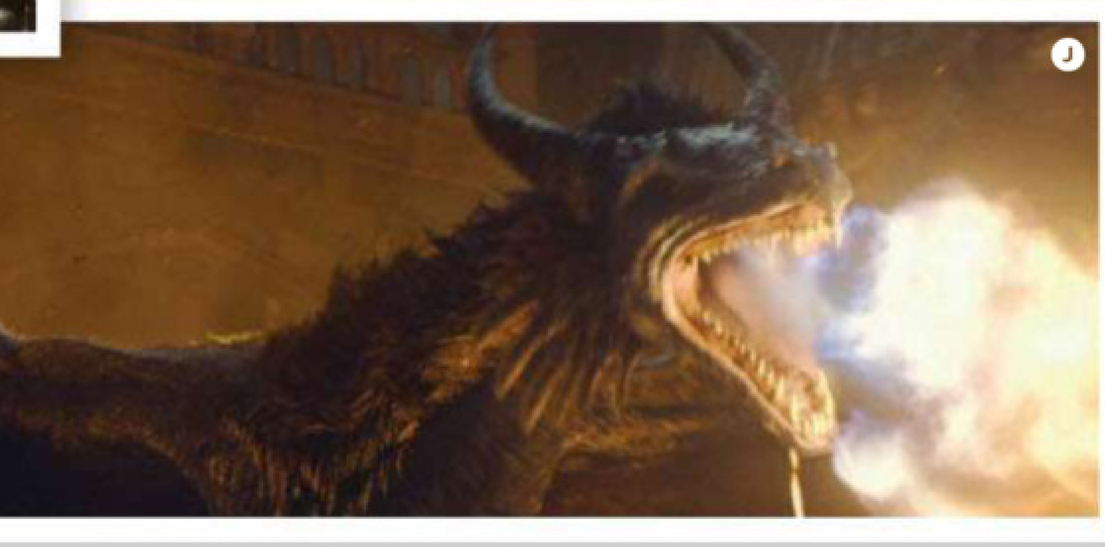

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environments from the basic elements such as trees, plants and rocks to fully dressed sections of land or islands. "Depending on the number and complexity of sequences, the layouts were handed over to lighting or directly to the environments department to start finishing up the shots," explains Ferrara.

Late on in the process, MPC were given a new shot to take the Disney logo and bring it into the world of the film, integrating the human world and the fairy world to show the audience how they interact in this story. That's the thing about VFX – it's not all trailer moments, but it's one of the most important tools in the modern filmmaker's toolbox. Thanks to the hard VFX work of Digital Domain and MPC, Maleficent – one of the most iconic villains from the Disney canon – has finally had the chance to tell her side of the story.

> "Although the look did continue to evolve during post-production, it always had a feeling of extra-realism"
>
> **Julien Bolbach and Audrey Ferrara,** MPC

I As well as playing their roles as pixies, Staunton, Temple and Manville had to play their roles in human form. This meant that it was not possible to be creative and artistic with the actresses' pixie characters, as it had to match their human counterparts

J Diaval the dragon required ZBrush for the design and sculpting and Maya for the retopolgy process. The UVs were created in UVLayout. The dragon ultimately took around 50 x 8k UV tiles in order to get the level of detail that was required

K *Maleficent* was the first show at MPC that only used KATANA in the look-dev and lighting pipeline in conjunction with PRMan for the rendering. Ultimately, most of the fully CG sequences were achieved with this pipeline

Studio Access

3D Systems

The inventor of the SLA 3D printing process speaks to 3D Artist about what it's doing today

Founded in 1986 by Chuck Hull and the creator of the first stereolithography rapid prototyping system, 3D Systems is a leading provider of 3D content-to-print solutions. These include 3D printers, print materials and on-demand custom parts. Its solutions complement traditional methods and reduce the cost of designing new products

www.3dsystems.com

Country USA

Ever since the invention of 3D printing, there has been well-deserved attention directed towards the technology in research labs and startups. It was, in fact, 3D Systems that first invented 3D printing with its stereolithography (SLA) printer, before going on to commercialise the practise in 1989. Today the process has opened up in the retail market with all kinds of possibilities.

3D printing with stereolithography technology has allowed manufacturers to create almost anything in 3D, in whatever medium they choose – even chocolate. 3D Systems' latest printers, for example, include the Cube 3 and CubePro printers; chocolate and sugar 3D printers; and a new mini consumer-grade stereolithography 3D printer, the ProJet 1200.

Grant Cameron, the managing director of Concurrent Design Group (CDG), a provider of 3D Systems printers in the UK, took 3D Artist through the offerings in clay, plastics and organic 3D print generating tools for the 3D artist.

"There are two product ranges from 3D Systems for generating products from an FBX model from Autodesk Maya or Pixologic ZBrush and the like," begins Cameron. "There are scanners as well as 3D-editing software, which are used to prepare the CG model for printing, and then there are the 3D printers themselves. The ProJet 4500 prints in full colour during creation, in plastic, whereas the ProJet 5500 does all of that, and in greater resolution, faster and using a wider range of mediums.

"All 3D printers operate in a similar way, and differ according to the materials used to form the model in layers," he continues. "In stereolithography you create the model out of thin layers of solid plastics using a laser beam. They create a physical phase change, converting the liquid medium into a solid, which adheres to the previous layer. There are niche markets now as well, with nylon printers and metal printers, acrylic printers and the full colour printers. It all depends on what material properties you want, what size model, what the resolution is and whether you want it in full colour."

> "In stereolithography you create the model out of thin layers of solid plastics using a laser beam"
>
> **Grant Cameron,** managing director at CDG

There are many artists stepping forward, trying 3D printing of their assets, and many are having a great deal of success. Larger businesses are stepping into the market with considerable gusto too, such as animation studio LAIKA, notable for stop-motion

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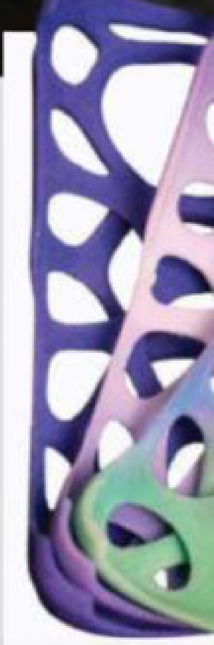

Contributors

Grant Cameron
Managing director, CDG

Brian McLean
Director of rapid prototype, LAIKA

B

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animation hit, *ParaNorman*, and currently working on the upcoming adventure *The Boxtrolls*.

Creative supervisor of puppet fabrication Georgina Hayns and director of rapid prototype Brian McLean from LAIKA will be speaking at SIGGRAPH 2014 in Vancouver about its use of 3D printers to pre-visualise puppet construction issues and control how practical materials perform. By using a colour 3D printer for releases such as *The Boxtrolls*, for release in October 2014, Laika was not only able to push facial performance to new levels, but it was "also able to achieve a level of detail and subtlety in characters' faces that a few short years ago would have seemed impossible," Brian McLean explains. Expect to see much more of 3D Systems' tech in future releases!

A A selection of small sculptures 3D printed in sugar using the 3D Systems ProJet 4500. With the current advances in 3D-printing technology, it feels like the possibilities for the future are truly endless

B In conjunction with 3D scanning, it is possible to print a statuette version of yourself, family or friends. The files from the scan can be taken into software and converted so they're ready for 3D printing

C With the use of the SLA 3D printers from 3D Systems it is possible to print a wide range of items, including mobile phone covers, in a wide selection of materials and colours. DIY accessories are here!

D Go to any printing show and you'll discover there are a huge variety of niche 3D companies. The 3D Printshow, with events across London, New York and Paris, is a great opportunity to see what they're up to!

E Examples of basketballer statuettes available to be printed in full colour in 3D System's ProJet printers. It's possible to print with a surprising level of detail and definition in the finished product

Industry insider

Jason Howey

VFX supervisor / CG artist at Hollywood Visual Effects

Jason Howey, one of Hollywood's top VFX artists and SIGGRAPH's favourite advocate, tells us why the conference is a must for cracking into the CG industry

About the insider

Job VFX supervisor / CG artist

Education Fine Arts degree in Drawing at Ball State University in Indiana

Website www.hollywoodvisualfx.com

Bio Jason spent a lot of his youth in bookstores reading everything he could about CG art. Later, he began to learn Maya by watching Gnomon workshop DVDs and practicing until it made perfect. After finishing school, he attended university to become a stronger artist and eventually landed his dream job in la-la land

Getting to the top takes talent, hard work and dedication, yet while Jason Howey had all this and more, it was actually a chance meeting that gave him his big break – and not even one that he was party to.

It all began when he set off from his hometown of Indianapolis, armed with his fledgling demo reel, to visit Los Angeles for his first SIGGRAPH conference. Howey, who made some greatly appreciated contacts at the event, fell in love with the city and decided to move there. "I was jobless and only had three months' worth of savings before I had to move back to Indiana," recalls the CG artist. "I remember thinking 'leap and the net will appear', and that's what happened. My landlord at the time was at an Oscar's party and met a woman that worked in VFX. He started talking about me and obtained her contact info at Reality Check Studios. I eventually met with her, she liked my demo reel and I ended up getting my foot in the door working on feature films in LA."

Now a partner of his own thriving company, Hollywood Visual Effects, Howey is as a much a fan of the SIGGRAPH conference today as he was during his first pivotal visit 16 years ago. To find out more about this year's event in Vancouver from the 10 to 14 August, head to www.s2014.siggraph.org.

How has being affiliated to SIGGRAPH helped you establish yourself in the industry?
SIGGRAPH is all about making connections and networking. I always see familiar faces when I go, and love getting caught up with people I haven't seen for a year. There is also a tremendous amount of collaboration that happens onsite. I've had a lot of work opportunities stir up over the years from connecting with SIGGRAPH friends, and volunteering at SIGGRAPH is also a great way to make even more connections.

What are you most excited to see at this year's event?
I've always loved the Computer Animation Festival. It's inspiring and energising to see what people have created in the past year and features the best of the best as chosen by industry experts. The other thing I'm always excited about is reconnecting with my SIGGRAPH friends. I've met a lot of great people from there over the years.

What lessons has your career path taught you?
I always like to push myself and create something I couldn't have created in the past. I try to train my eye to see more of what's going on in my work. I try not to allow myself to justify a flaw that needs to be fixed just because I'm tired of working on it. I've found that pushing myself usually means learning how to create something more efficiently. Knowing what's wanted is very important, so I must look at my work through not just my eyes, but the eyes of the director and producer too. I've made some really cool, flashy effects that I've gotten notes back to make more boring. They were distracting and pulling people out of the story. As well as this, I try not to be afraid to bend reality. Movies aren't real, nor should they be – exaggeration is an element of art.

What's the secret weapon in your workflow?
Planning and organising is key, so I'll size up how long every shot should take, summarise what techniques I plan to use and work on creating templates that can be used over and over. I create a schedule for how much work I need to complete every day and stick to it, plus I make a database of tasks where I can easily track my progress. Having a strong review process is important too, so can cross-check that all shot requirements have been met: it's important not to send out flawed work.

Portfolio highlights

Some recent features that Jason Howey has worked on:

2013 *Grudge Match*
2013 *The Incredible Burt Wonderstone*
2013 *Gangster Squad*
2012 *The Baytown Outlaws*
2011 *Something Borrowed*
2010 *The Switch*
2009 *This Is It*
2009 *Drag Me To Hell*
2008 *Harold and Kumar 2*

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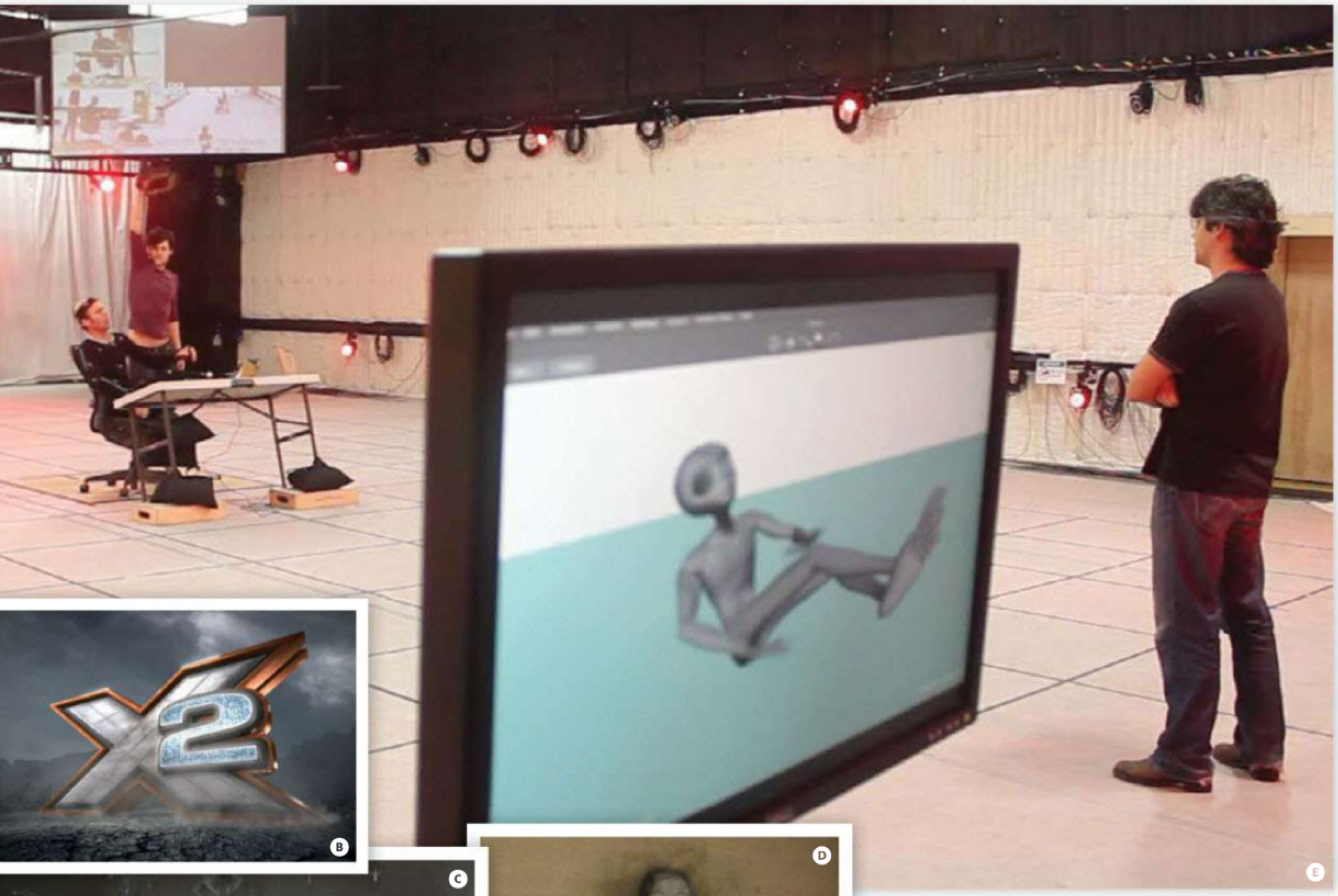

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Why go to SIGGRAPH?

Jason explains why SIGGRAPH is the largest and most prestigious computer graphics convention and exhibition in the world, and more importantly why you should go

"It's a great place to meet other people in the industry, learn the latest technology, and be inspired by amazing art, all packed into five days. You'll find Oscar-winners rubbing elbows with artists, scientists, programmers, game developers, researchers, mobile and display experts, students and people that just have an interest."

> "Knowing what's wanted is very important – I must look at my work through not just my eyes, but the eyes of the director and producer too"

A "The house interior, aquarium, and the foliage outside are all 3D, created in Maya, while the woman and furniture are taken from a green screen element"

B "During my career I've used Maya, V-Ray, RealFlow, Cinema 4D, After Effects, Photoshop, boujou, FileMaker Pro, Rush, Deadline, Backburner, NUKE, RV and Shotgun"

C "This image is taken from the *Thriller* video in *This Is It*. It was going to be used in the Michael Jackson Tour, but after his death it was used in the documentary"

D A shot from the film *The Messengers*. The growing stains on the wall were procedural textures created in Maya and the ghost that emerges was from a green screen

E "This is me on set at a mo-cap studio. This was for a fully animated series of three commercials where an alien finds a pair of shoes while sifting through space junk"

ip

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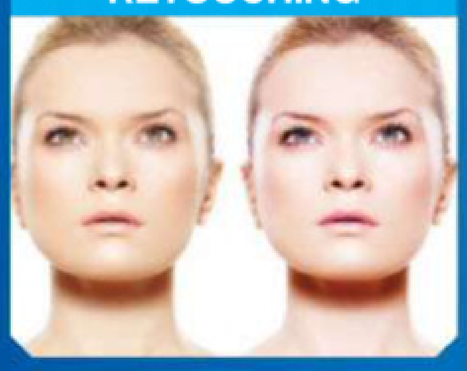		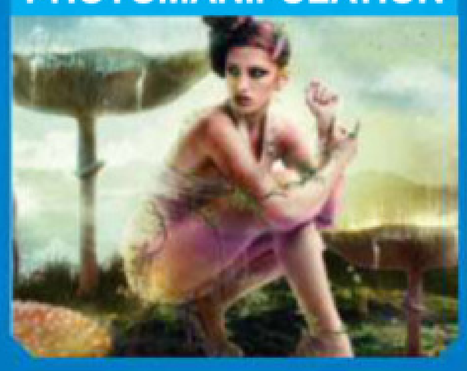		

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